

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XXX. No. 9.

DECEMBER, 1923

NOTES FOR THE MONTH.

SIR ROBERT SANDERS, Minister of Agriculture, outlined the agricultural policy of the Government at a meeting at Cirencester on the 15th November, 1923. He

Government's Agricultural Policy.

said, if returned to power, the Government proposes to give a subsidy of £1 an acre on all arable land to occupiers of holdings of more than one acre in extent. Market gardens and land under fruit and hops are included. One of the main objects of the subsidy is to prevent increasing unemployment, and the consequent fall in wages. It will, therefore, not be given to any farmer who pays a wage of less than 30s. a week to able-bodied adult workers. When wages rise above that minimum, it is confidently hoped and expected that the labourers will, in the ordinary course, obtain in their wages their share in the benefit of the subsidy.

"In this regard it rests with the farmers to prove in practice that wages boards are unnecessary for that purpose. But the Government must reserve the right in cases of necessity to establish machinery to ensure that a fair wage is paid. This is not the time to go into details, but I ought to say that it will be necessary to make provision to prevent rents being raised on account of the subsidy. That raises the question whether, if a subsidy is given, it should be given upon acreage or upon the amount of production.

"The Government have decided, and, I think, rightly, in favour of giving it for acreage, because, if you give it according to the amount of production, then the man who is cultivating the best land, and consequently gets the best crops, gets the greatest advantage. What we want to do is to keep the poor land under the plough, and it is only by making this arrangement upon the basis of acreage that you can ensure that being done. This scheme ensures the minimum of Government control. The Ministry of Agriculture have had considerable experience in this matter of inspection and Government control, and

they have deliberately arrived at the conclusion that a subsidy on the basis of acreage leads to very much less control and interference than a subsidy on the basis of production.

"We all hate inspection and control. We all hate seeing Government officials about the place. We believe that such a system as I have foreshadowed is the system by which you can best give real assistance to arable cultivation, and at the same time ensure the minimum of red tape."

Sir Robert Sanders said there was a measure in connection with which he had come in for a considerable amount of criticism, and that was the proposal to put a duty on imported malting barley. When Mr. Bonar Law was Prime Minister that was announced as part of the policy of the Government. Their intention then was to put an Excise duty, a duty collected within the country, upon imported malting barley. It was ascertained that there were certain treaties with foreign countries which prevented them from doing that at once. They then set to work to see whether they could not do it by means of a Customs duty, and the Committee which had lately been sitting had found a way, and one which he thought was workable, practicable, and satisfactory, in which they might impose that duty by means of a Customs instead of an Excise duty, and it was the intention of the Government, if returned, to put a Customs duty on malting barley.

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THE recommendations made in the First Interim Report of the Agricultural tribunal of Investigation were summarised in this *Journal* for May last, p. 110.

**The Second
Interim Report of
the Agricultural
Tribunal.**

The Tribunal was appointed on 29th December, 1922, "to inquire into the methods which have been adopted in other countries during the last fifty years to increase the prosperity of agriculture and to secure the fullest possible use of the land for the production of food and the employment of labour at a living wage, and to advise as to the methods by which those results can be achieved in this country."

The Second Interim Report* was issued on 17th November. It recalls that the decline in the arable area is no new thing, as, with the exception of the years 1916-1920 and save in individual years, there has been a steady decline during the last fifty years. In 1873 the arable area in Great Britain was 18,186,671 acres; in 1923 it is 14,478,013 acres, a decline of

* H.M. Stationery Office, Cmd. 2002, 3d. net.

3,708,658 acres, or 20 per cent. A great part of this decline is due to a shrinkage of over 48 per cent. in the wheat area. The movement shows no sign of slackening. The Tribunal state that they would view with grave concern any substantial decrease in the present arable acreage of the country, since the maintenance of that area is an important factor in the maintenance up to pre-war level of the home production of food, and of the employment of labour.

The Tribunal express the view that "if the decline in the arable area is to be at least checked, immediate direct action by the Government is necessary. If left to itself the farming industry will necessarily adjust its practice so as to make farming pay. But under present circumstances it will be farming of a character which will involve a material reduction in the supply of home-grown food and a serious decline in the number of men employed on the land, thus adding yet further to the burden of unemployment." They come definitely, though reluctantly, to the conclusion that, in order to maintain the agricultural area, either a guarantee or a subsidy would be necessary.

Discussing the question of a subsidy or guarantee the Tribunal point out that the unequal incidence of a subsidy is inherent in any scheme that may be devised. They suggest alternative methods:—(1) a subsidy on each acre of arable land in excess of 12,000,000 acres, this being the arable acreage below which the total in Great Britain is not likely to fall; (2) a subsidy of £1 per acre on the whole arable area; (3) a guaranteed price to the farmer for his wheat—a subsidy on output; (4) an acreage subsidy on wheat, thus not penalising poor land; (5) a subsidy on wages by a contribution from the State to the farmer's labour bill; and (6) that land under the plough should be given assistance through partial relief from national taxation. Discarding certain methods as being administratively difficult, or unequal in their incidence, or encouraging all types of farming instead of arable farming in particular, the Tribunal prefer a scheme which combines a subsidy on all arable land with an additional subsidy on land under wheat. They therefore recommend a subsidy of 10s. per acre on all arable land as defined (that is, all land ploughed during the year, including summer fallow, but excluding land under clover and grass seeds, small fruit, orchards and hops) and an additional subsidy of 10s. per acre on all land under wheat.

In making their recommendation the Tribunal are of opinion that "in order to place a premium on good farming the Minister of Agriculture should have power to reduce or withhold altogether the subsidy in cases where he is satisfied that the farmer has not cultivated his holding according to the rules of good husbandry as defined in the Agriculture Act, 1920, and we consider that the County Agricultural Committees should be charged with the duty of furnishing the Minister with the necessary information."

The Tribunal renew and emphasize the recommendations in their First Interim Report with regard to the creation of district Agricultural Wages Boards, as they "could not contemplate a subsidy to agriculture unless a considerable portion of the benefit thereby accruing to the industry was in fact enjoyed by agricultural workers."

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THERE is a great need for an increase in the number of pigs kept in this country, and particularly of high-grade bacon pigs.

Pigs for Bacon. In order to create an interest in this side of farm produce, a number of articles have been published in this *Journal* in recent months. In this issue appear two such articles, one of which is especially devoted to the production of bacon pigs. It is hoped that the latter is a sound statement of what most farmers need to know regarding the points of a bacon pig, and that with this before them they will have less difficulty in producing what the curer wants. It is not a question of breeding an improved variety of pig: the Danes, so often held up as models, use British pedigree boars for producing their bacon pigs. Nor is it a question of nature of food, for the Danish pig is fed on standard lines—largely with foreign barley. Yet the difference in the results is striking.

The view is held that, whereas at least three-quarters of the Danish pigs give first quality bacon, less than one-quarter of the English pigs reach that standard.

It would appear that the Danes secure their results by the adoption of the following methods:—

1. Concentration on the single aim of producing a side of bacon pig for the English market, without considering the pork pig.
2. The co-operative and State control of the whole business from start to finish. Beginning with the boars, they do what is in accord with modern views on genetics. For example, boars whose progeny do not come up to a certain standard are

slaughtered. In other words, the test applied is *progeny*, not pedigree. Further, the standard is not a fancy one based on external points. It depends mainly upon precise measurements of the carcass, and consideration is given also to such matters as early maturity, capacity of flesh to take up salt readily, distribution of fat and lean.

It is clear that the Danes have succeeded because they have organised the whole business of bacon production, from breeding to curing and marketing. In this country there is a lack of unity of aim or effort. Some farmers aim at producing the "porker," and only carry it on to bacon weights when the pork market is bad. Others are thinking of the pedigree trade, and "points" have too often been determined by the fancy of judges and breeders without sufficient consideration of the economic aspect of the carcasses.

Some excuse for the farmers' attitude, however, is to be found in the confusion between the requirements of pork butcher and bacon curer respectively, which have not been clearly defined in the markets. Again, bacon curers have not always paid a better price for the good bacon pig. As Professor Wood pointed out in the course of a discussion at Cambridge last May, the farmer is insufficiently in touch with the consumers' market. Just as Professor Biffen made an advance in wheat breeding by consulting the miller, so progress in other branches of technical knowledge will be promoted by co-operation with persons engaged in the actual businesses which handle the farmers' raw materials.

The conclusion of the whole matter seems to be that there is one procedure which may go a long way to remedy the existing state of affairs. We need more standardisation of our production. What the English market requires and appreciates is a *regular supply of a standard product*—whether it be cheese, butter, fruit, bacon or corn. It is the finest market in the world. The irony of the position is that the best English produce is still superior to anything coming from abroad. The best Wiltshire bacon still commands the highest price, but no one can undertake a future delivery of regular supplies of uniform quality. Yet as Mr. J. M. Harris has pointed out, the Danes can contract to supply sides by the thousand, all of one quality. Co-operative societies, after all, are only methods; it is organisation, and the common purpose inspiring and actuating the whole mechanism of production and supply that count.

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The Annual Report of the Official Seed Testing Station will be published by the National Institute of Agricultural Botany in its Journal for 1923, which will be available early in the New Year. The following notes summarise the results during the season ending 31st July, 1923.

The number of samples received for testing was 21,678, which is a considerable reduction on the figures for 1921-22. The reduction occurs in the number of samples received from seed firms, there being little change in the number received from farmers. The decrease is particularly noticeable in the case of red clover seed, the samples of which were 50 per cent. fewer than in the previous season. The main points of interest are as follows:—

Cereals.—Owing to the adverse harvest conditions in 1922 an increased number of samples showing low germination was received. This resulted in a decrease in the general average, which was especially marked in the case of oats, of which no less than 17.3 per cent. of samples germinated below 85 per cent., as compared with only 7.5 per cent. below that figure in 1921-22.

The number of samples showing indication of disease was, however, noticeably less. In the case of wheat 15.7 per cent. of the samples contained bunt, and 2.8 per cent. showed traces of earcockles, as compared with 33 per cent. and 9 per cent. respectively in 1921-22.

Pulse.—The germination of field beans and vetches has been considerably lower than usual. Vetches in particular were of poor quality, over 50 per cent. germinating below the minimum percentage scheduled in the Seeds Regulations.

Roots and Vegetables.—Owing to the unfavourable harvest conditions the germination of most of the root and vegetable seeds was somewhat below the average of recent seasons. Onion and carrot, however, show a slight, and parsnip a very considerable, increase in percentage germination over last season.

Clovers.—New Zealand seed shows the highest purity and germination. It is unfortunate, however, that more attention is not paid to the removal of the small-seeded dodder from this seed. Alsike was of average quality, but mid-European samples produced better figures than usual.

Lucerne, trefoil and crimson clover showed figures very similar to the previous seasons. White clover, however, averaged rather higher germination, but lower in purity. Wild white clover con-

tained a larger percentage of impurities than usual. Sainfoin showed a marked drop in both purity and germination.

Grasses.—Perennial ryegrass was of average quality, but Italian ryegrass was below the average. It is worthy of note that over 50 per cent. of the Italian ryegrass samples contained 1 per cent. or over of injurious weed seeds, whereas this figure has previously never exceeded 40 per cent. Cocksfoot was of rather better quality than usual, and particularly free from injurious weed seeds. The average purity of meadow fescue and dogstail also showed an appreciable increase. Timothy was of average quality. Other grasses call for little comment; they all show a high percentage of impurity, but this in all cases consisted almost entirely of chaff.

An account of the administration of the Seeds Act, 1920, during the year 1922-23 will be found at p. 822.

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SEEDS are perhaps more variable in quality than any other goods the farmer has to purchase. The purity of seeds varies

**Farmers and the
Seeds Act, 1920.**

according to the manner of growth of the seed crop and the methods of harvesting and cleaning it, and the germination power varies with the weather during the period of growth—especially at the time of harvesting—as well as with the method of harvesting and storing.

The Seeds Act, 1920, makes it compulsory in the case of a sale of any of the principal kinds of grass, clover, field or garden seeds, for the seller to state in writing certain essential particulars as to the quality—including the percentage purity, percentage germination, and the presence of injurious weed seeds.

Farmers, when buying their seed, should ensure that they receive this statement, to which they have a statutory right.

It is most important for farmers to note that in selling seed corn, or any of the scheduled kinds of seeds intended for sowing, such as red clover, tares, etc., they are in precisely the same position as a seedsman, and are bound to supply the same guarantee. Thus, a farmer selling a sack of home-grown clover seed to a neighbour for sowing must, in the first place, have a sample tested, and supply the buyer with a copy of the result not later than the date on which the seed is delivered. Any farmer can have the required test made at the Official Seed Testing Station, Huntingdon Road, Cambridge.

Further information as to the particulars required to be declared, and of the fees charged at the Official Seed Testing Station, are given in Circular No. 728/C.S., copies of which may be obtained free on application to The Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

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In the June number of this *Journal* an article entitled "Village Life and Country Industries" was prefaced by a paragraph in which it was explained that the article was the first of a series on Rural Industries which was in course of preparation by the Rural Industries Intelligence Bureau. It was intended that all these articles should first appear in this *Journal*, but would be subsequently available in the form of reprints on application to the Bureau.

The Rural Industries Intelligence Bureau and its Leaflets.

Since the issue of that number, which also contained a shorter article entitled "Hurdle Making by Machinery in North Wales," other articles on rural industries have been published herein. It has subsequently transpired, however, that the Bureau, in view of the large amount of information which is now reaching it on various subjects, has found it impossible and undesirable to attempt to compress these articles within such uniform limits as would make their inclusion in the *Journal* possible. For reasons of space, therefore, it has proved impracticable to include in the *Journal* certain articles on subjects which are not of general interest to the farming community. These articles have consequently been issued directly by the Bureau in printed form and uniform with the reprints of articles from this *Journal*.

The practice of including articles in the *Journal* nevertheless will continue to be followed as far as possible (*vide* "Mat Making" in the present number), but it may be desirable at this stage to furnish, for the benefit of interested readers, a list of leaflets issued up to date. In the following list, leaflets marked with an asterisk have already appeared in these pages:—

- * Village Life and Country Industries (Leaflet No. 1).
- * Hurdle Making by Machinery in North Wales.
- * Straw Ropes and Straw Envelopes (Leaflet No. 2).
- Peat Firelighters (Leaflet No. 3).
- The Village Blacksmith and His Outlook (Leaflet No. 4).
- * Walking Sticks (Leaflet No. 5).

Suggestions and Opportunities for the Rural Woodworker (Leaflet No. 6).

Handloom Weaving and Handspinning (Leaflet No. 7).

* Matmaking (Leaflet No. 8).

Compressed and Composition Firelighters (Leaflet No. 9).

Copies of all the above can be obtained on application to the Rural Industries Intelligence Bureau, 258-262, Westminster Bridge Road, London, S.E.1.

After rising slowly for three months, the general index number of the prices of agricultural produce fell sharply in October, owing mainly to the much lower level at which hay of this season's crop is selling as compared with the prices of the 1922 crop. There was also a sharp fall in the index number for fruit, which is now based on apples only, whereas in September plums and pears, which were relatively very dear, were on the market. The general index number for October is 51 per cent. above pre-war, and is thus back at the same level as in June, and is 5 per cent. lower than a year ago.

The following table shows the percentage increase in each month since January, 1920 :—

PERCENTAGE INCREASE COMPARED WITH THE AVERAGE OF THE CORRESPONDING MONTH IN 1911-13.

MONTH.	1920.	1921.	1922.	1923.
January	200	183	75	68
February	195	167	79	63
March	189	150	77	59
April	202	149	70	54
May	180	119	71	54
June	175	112	68	51
July	186	112	72	53
August	193	131	67	54
September	202	116	57	56
October	194	86	59	51
November	193	79	62	—
December	184	76	59	—

The average price of wheat remained unchanged at 8s. 11d. per cwt., but as there was a slight fall in October in the pre-war period, the index figure advanced by one point. Barley declined by 9d. per cwt. and oats by 1d. per cwt., against a rise of 2d. per cwt. between September and October, 1911-13, and the index number in each case declined by 5 points to 25 per cent. above pre-war. As compared with a year ago each cereal is cheaper by 3 to 6 per cent.

Most of the hay on the market during October was of this season's crop, and no doubt owing to the heavy yields this year, prices of new hay are much lower than those which have ruled for old hay. Clover hay is realising about 13 per cent.

more than in 1911-13, whilst meadow hay prices are at the pre-war level, hay being now relatively cheaper than any other class of agricultural produce.

Following the sharp fall in the latter half of September, potato prices have been fairly firm throughout October, and during the last two weeks a hardening tendency was in evidence. The index figure, however, shows a decline of 13 points on the month, the average price in October being 62 per cent. above pre-war, which compares with only 3 per cent. above in October, 1922.

The price of fat cattle has varied very little since the middle of August, and during October averaged 44 per cent. above 1911-13, or a little over 3 per cent. less than a year ago. Fat sheep prices have hardened during the last three weeks, and averaged 76 per cent. above pre-war in October, a rise of 4 points on the month. Fat pigs, on the other hand, which have been in large supply and affected by the decline in the price of bacon, have become cheaper, and declined by 7 points on the month to 48 per cent. above 1911-13. A year ago fat pigs were selling at 85 per cent. above pre-war prices.

As is usual in October the price of dairy cows advanced, but this year the rise was sharper than before the war, and the index figure rose from 52 per cent. to 61 per cent. above pre-war. The markets for store cattle have been disorganised in some districts by foot-and-mouth disease restrictions, but with the autumn demand increasing, prices have hardened somewhat. The rise has, however, been relatively the same as before the war, and the index figure remains unchanged at 27 per cent. above 1911-13. Store sheep were also dearer in October, but the rise was not so great as usual, and the index number shows a fall of 10 points to 99 per cent. above pre-war. Prices of store pigs have declined in sympathy with those of fat pigs and were 82 per cent. above 1911-13 in October against 95 per cent. above in September. It may be mentioned that the index figures of dairy cattle and store stock are not taken into account in calculating the general index number for all classes of agricultural produce, as store stock when sold simply pass from one farmer to another.

Winter milk prices came into effect at the beginning of October, and the average contract price in October was 72 per cent. above pre-war; a year ago the increase was 90 per cent. In the case of both butter and cheese the rise in price in October was sharper than usual, and the index figure for butter advanced

y 5 points and for cheese by 2 points on the month. Cheese is 0 per cent. dearer than in October, 1922, but butter is 6 per cent. cheaper. Eggs are now very dear, and during October averaged 92 per cent. above pre-war, but were 6 per cent. cheaper than a year earlier.

The following table shows the average increases during recent months in the prices of the principal commodities:—

PERCENTAGE INCREASE AS COMPARED WITH THE AVERAGE PRICES RULING IN THE CORRESPONDING MONTHS OF 1911-13.

Commodity.	1922.					
	Oct.	June	July	August	Sept.	Oct.
Wheat ...	24	38	39	29	19	20
Barley ...	29	17	12	9	30	25
Oats ...	33	41	41	30	30	25
Fat cattle ...	49	52	45	46	45	44
Fat sheep ...	90	83	72	76	72	76
Fat pigs ...	85	69	54	52	55	48
Dairy cows ...	69	50	49	51	52	61
Store cattle ...	30	31	28	28	27	27
Store sheep ...	106	114	109	101	109	99
Store pigs ...	135	130	113	102	95	82
Eggs...	104	40	36	68	75	92
Poultry ...	77	87	79	61	67	65
Milk ...	90	53	57	67	67	72
Butter ...	71	33	37	48	56	61
Cheese ...	36	44	54	67	74	76
Potatoes ...	3	—31*	66	80	75	62
Hay ...	45	42	38	34	32	7

* Decrease.

The agreement of the Cheshire Committee, which was due to expire on 31st October last, has been extended up to 30th April, 1924. The terms provide for payment to adult male workers at the rate of 32s. for a 54-hour week, with overtime at 9d. per hour.

The Lancashire Committee has decided to extend the period of operation of its last agreement from 31st October last to the end of January, 1924. The weekly rates of wages for adult male workers for the normal working hours are as follows:—Southern Area: special classes, 35s., other workers 32s. 6d.; Northern Area: special classes 37s. 6d., other workers, 35s.; Eastern Area: special classes 40s.

The Committee for Shropshire has also agreed to maintain wages at their present level, the agreement due to expire at the end of October last having been extended up to 1st March, 1924. The rates are 30s. for a guaranteed week of 54 hours for able-bodied adult male workers, and 9d. per hour for Sunday work.

THE BACON PIG.

There is in this country a large demand for bacon of the best quality—a demand which is at present inadequately satisfied by the British producer. There has been a considerable expansion in pig-breeding since the War, but the output as yet does not even meet the demand for fresh pork, still less for pigs to be converted into bacon. The rearing of pigs offers one of the most remunerative opportunities open to the British farmer, and is still capable of great expansion, especially in view of the low prices ruling for cereals and other farm crops upon which the pig may be fed.

It is not the purpose of this article to discuss the various alternative methods of pig-keeping that may be adopted or the relative advantages of pork and bacon production. These must be determined by the conditions of the farm and the local market. The farmer who sets out to produce bacon pigs should breed and feed with the object of turning out a uniform product of the type that can be converted into first quality bacon with the least amount of waste. It may be emphasised that a pig suitably bred for the bacon manufacturer is usually an excellent pork pig; but it does not follow that a pig which may be killed for pork is of suitable structure for first quality bacon.

Strong representations have been made to the Ministry by the bacon curers that they are unable to obtain sufficient pigs of the right quality to enable them to keep their businesses running at full power, and that in particular they receive an undue proportion of pigs which cannot be converted into first quality bacon. It is stated that in other countries, notably Denmark and Sweden, where pig rearing has been organised for the production of bacon, as many as 75 per cent. of the pigs sent to market are convertible into first-class bacon, largely as a result of aiming at a standard type, whereas in England, doubtless partly owing to the numerous breeds and crosses, the proportion is no higher than 25 per cent. A large proportion of the pigs in the remaining 75 per cent., although of good quality, are too fat and heavy for first-class bacon.

In some respects the responsibility for this undesirable state of things rests with some of the bacon curers who have paid upon a basis of weight alone without reference to the suitability of the carcass for bacon production, but the Ministry is aware that certain firms of bacon curers have now become

selective in buying and are adopting an improved method of payment.

The Ministry considers that the development of the bacon industry and the production of the right type of bacon pig will depend upon the financial inducement offered to the farmer by the bacon curer for the supply of graded pigs at recognised graded prices. The farmer, too, should realise that by helping forward the bacon industry he is stabilising prices for himself. The producer, the curer and the retailer are all equally interested in the industry, and equally responsible for increasing and improving the supply of English bacon. They are, in fact, partners, and the interest of each is bound up with that of the others, and close co-operation between them is essential.

The Bacon Pig.—The ideal bacon pig should conform to the following standard :—

1. *Back*.—Long and level, with ribs well sprung.
2. *Sides*.—Level and moderately deep.
3. *Hams*.—Broad, wide and deep to hock. Tail set high.
4. *Belly and Flank*.—Thick with straight underline.
5. *Shoulders*.—Light, and on a line with forelegs below and with sides laterally. Free from wrinkles and coarseness.
6. *Flank*.—Aligned with the sides.
7. *Head, Neck and Jowl*.—Light.
8. *Legs*.—Short, and set wide apart. The pig should stand well up on the tips of the toes.
9. *Bone*.—Fine.
10. *Flesh*.—Firm, without excessive fat.
11. *Skin*.—Free from coarseness and wrinkles.
12. *Hair*.—Fine.

There should be no rolls of coarse fat at the jowl or over the neck, and no depression between the hams at the root of the tail, as this indicates excessive fat. The pig should be full and firm behind the elbow, and the flank, which should be thick, should handle firm. The streak cannot be too thick so long as there is a proper proportion of lean to fat. The fat part of the back should never exceed $2\frac{1}{2}$ in. in thickness, and may be as little as $1\frac{1}{2}$ in. in thickness. Fineness of bone is of great importance.

The size calculated to produce the best price is the medium bacon pig producing sides when cured of 56-65 lb. in weight, i.e., a pig approximately 220 lb. live weight or 160-165 lb. dead weight. Such pigs should be ready at about seven months old. Heavier pigs, up to 260 lb. live weight, find an outlet in the Midlands and the North, and many are absorbed by the ham and cutting trade, the loin being sold for pork and the hams and bellies cured for bacon. Animals over 260 lb. live weight are not likely to sell at higher prices than fat sows. The

farmer should acquaint himself with the weight desired by the bacon curer with whom he deals.

Breeds and Breeding.—The ideal bacon pig can be raised in many ways from the various English breeds. It is generally agreed that the bacon type of pig can best be obtained as a first cross, using one of the large breeds to attain length of side. It is rarely wise to go beyond the first cross, as with a second cross the progeny often fail in uniformity of type. As an example of a suitable cross, many rearers of bacon pigs use Large White boars for their length of side, with a Middle White sow to secure more rapid growth and a better ham and streak. A cross the other way about also makes a very good bacon pig. The bacon pig can, however, be obtained from other breeds and crosses provided that the breeder keeps in mind the type outlined above. Owing, however, to the presence of black pigment in the mammary glands of certain races of black pigs, producing the so-called "seedy cut" in the streaky, wholly black pigs should be avoided, unless, as seems possible, strains can be selected which do not show "seedy cut." The progeny, however, of crosses when one parent is pure white rarely show "seedy cut"; for example, Large Black sows crossed with a Middle White boar, or Large White over Berkshire yield pigs which are mostly white or blue and white and are less likely to show "seedy cut."

Feeding.—The feeding of pigs for bacon is not dealt with fully here. It will be sufficient to emphasise the fact that bacon pigs should not be too fat but should show a good proportion of lean, and that foods tending to produce soft fat should be avoided. An excess of swill or too much maize or linseed tends to produce an undesirable quality of fat. The use of fish meal is risky. Fish meal should only be employed when the farmer can make certain (1) that he obtains the right kind of white fish meal; (2) that the man in charge of the pigs will only feed to each pig the strictly limited amount which can safely be fed without tainting the flesh. Even this limited use of fish meal is undesirable after the pigs reach about 100 lb. live weight, but in any circumstances the use of fish meal should be discontinued four weeks before the pigs are sold for slaughter. The use of the wrong kind or of an excessive quantity of fish meal, or fish meal used too close to the killing time results in a taint in the flesh of the pig which renders it absolutely unfit for bacon. Cod liver oil is perhaps even more dangerous.

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PIG-KEEPING.

IV.

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*Selection, Feeding and Management of Breeding Stock;
Open air Pig-Keeping on Grass and Forage Crops;
Supplementary Rations; Methods Employed in Folding.*

Selection of Breeding Stock.—In purchasing their foundation stock, there are several courses open to those starting pig-keeping. Pigs can be bought in the ordinary market, or at pedigree pig sales, or privately. The first method is least to be recommended, because the buyer is usually unable to learn enough about the pigs' ancestry. He does not know whether they may or may not have been in contact with disease. He may not even know the farm from which they have come, and it is important that he should have information on these points. For those reasons private purchase from reliable sources is perhaps most satisfactory.

At pedigree stock sales, pigs are often offered in very fat condition. Superfluous fat fills up many hollows and smooths down many humps, and with an outside covering of fat, pigs can be made to look attractive to would-be purchasers. Certain buyers are impressed by the size and apparent substance of fat heavy animals and good prices have been obtained for them. In addition to obscuring faults, superfluous fat has other disadvantages. If deposited in excess in the reproductive organs, it may seriously impair the breeding capacity. If deposited in the udders of females, it may interfere with milk production. If a sow farrows in this over-fat condition she is much more likely to be lazy and clumsy and to lie on her pigs. The practice of offering very fat pigs at sales of breeding stock should be discouraged.

A clever judge can recognise a good pig even when it is in "the rough" or in ordinary breeding condition; a poor judge can only appreciate an animal when it is fat. The services of the former may be very helpful to a beginner in choosing his foundation stock. It should be clearly understood that there is a difference between "fatness" and "fitness." A well-bred pig which has been suitably fed and managed will have that "fit," attractive appearance which is secured by an even covering of firm flesh and by that nice "bloom" of coat and

skin which is associated with good health and vigorous and sound digestion.

Animals intended for breeding should be selected from uniform good sized litters. The dams should be good milkers, and healthy, good tempered and careful mothers, active foragers and typical of the breed to which they belong.

If possible, the purchaser of breeding pigs should see their sire in order to learn whether he is a good specimen of his breed. He should also see as many of his litters as possible, to enable him to form an opinion as to his breeding capabilities. The progeny of a coarse, strong-boned, rough boar should be avoided, as it is possible they may be deficient in quality and lack early maturity.

Gilts selected for breeding should have not fewer than twelve teats, and they should have a reasonable standard of weight for age, taking into consideration the amount and nature of the food which they have been receiving. If possible, gilts of sixteen weeks old or upwards should be selected, because with younger animals it is more difficult to form a reliable idea as to how they are likely to develop. In-pig gilts are usually a good investment as they are near profit, and yet have the whole of their productive lives in front of them.

At sales the older sows are sometimes well worth the money they realise, and if one can find out beforehand what sort of breeders they have been, and if their udders are still sound, they may prove an economical purchase. On the Moulton Experimental Farm an old sow born in 1916 reared litters up to 1928, and another born in 1918 has reared twenty-seven pigs in her last three litters. It is a common opinion that sows should be discarded for breeding after their fourth litter, but provided the sow is breeding well, it would seem advisable to breed from her as long as she will produce profitable litters.

It cannot be too strongly emphasised that in selecting foundation stock, the buyer should keep in mind the importance of breeding uniform pigs. The females should therefore not only belong to the same pedigree breed, but they should be in themselves as uniform as possible. Further, pedigree pigs will produce thriftier offspring than mongrels. There is everything in favour, therefore, of keeping pedigree breeding stock whether one is to produce pure bred or first crosses.

In selecting a boar one should try to get an animal conforming as nearly as possible to the standards already laid down, but in addition, he should be of a type likely to correct in his

offspring the prevailing faults of the sows. An active boar that champs and foams at the mouth when brought near another boar, and which exhibits signs of keen sexual excitement when near a sow which is in season, is likely to prove a sure stock getter. An animal which does not readily show sexual excitement may prove slow at service or may refuse to serve altogether. A savage boar is undesirable, both because he is difficult to handle and because he may breed restless and troublesome pigs. A boar should be fit for service at 8 to 10 months old.

The correct age at which gilts should be mated is a matter on which there is some difference of opinion, but on the average a gilt should be fit to serve at about ten months old. If served at eight months, which is a usual age, she is apt to remain undersized and will have difficulty in rearing sufficiently well a fair-sized first litter. If, on the other hand, she is not mated till one year old, which is the common practice in many of the pedigree herds, she may become overfat, and there is then greater difficulty in getting her to settle to the boar. In addition, at the times when she is in season before service, and more particularly after she has attained the age of ten months, she is usually very restless and excited. The body temperature is temporarily raised, and after she goes off season there appears to be a general lowering of vitality, with the result that she is then more liable to contract a chill or other illnesses.

With regard to the feeding and management of breeding stock, the main point of importance is to keep them in healthy, active, fit condition without allowing them to become too fat. Plenty of exercise, attention to the provision of a fairly easily digested ration with a sufficiently narrow albuminoid ratio,* and an adequate and regular allowance of green food or roots, should go far to secure the desired condition. At about a fortnight before the sow is due to farrow, she should be put in the sty or hut where the litter is to be born. She requires some little time to become used to new quarters—many unsuccessful farrowings are due to putting the sow in fresh and unfamiliar surroundings too near the time of farrowing.

From the time a sow is put in her farrowing pen she should be fed on about 4 lb. per day of a special ration suitable for farrowing and suckling sows—that is to say, a slightly laxative ration with a narrow albuminoid ratio, and preferably containing 10 per cent. of bran. The percentage of barley or maize meal should not exceed 25 per cent., and an effort should be made

* This *Journal*, October, 1923, p. 630.

to secure for her a daily supply of fresh green stuff. The farrowing pen or hut should be about 9 ft. square, and a farrowing rail 9 in. from the ground and 9 in. from the wall is useful in preventing the sow from lying on her pigs. Short chaffed straw is recommended for bedding, as the little pigs are less liable to get entangled in it than in long straw, and are thus less likely to be smothered.

A sow that has been treated in this way should farrow without difficulty, and cases where interference or assistance is necessary on the part of the herdsman are found to be extremely rare. The herdsman should be discouraged from interfering with the sow, and it is only when it has become clear that there is some abnormal condition, that any interference is justifiable, and this should only be carried out after the most careful disinfecting of the hands and arms in a sufficiently strong antiseptic. Before the hand is inserted in the vagina or passage, it should be smeared with carbolised vaseline. The cleanse or placental membranes should be removed from the sty to prevent the sow eating them. After a prolonged or difficult farrowing the sow might be given her first meal warmed to the temperature of the body. Warm milk answers excellently.

For the first few days after the birth of the litter, care should be taken that the sow is not overfed. Overfeeding or the employment of a ration which is not sufficiently digestible will interfere with milk production, or in serious cases induce that abnormal condition of fever which results in the sow eating or destroying her pigs. After careful investigation of this matter of sows' "savaging" their pigs, the writer can say that he has found this to be very rare where proper care and attention is given to the feeding and management of the farrowing sow.

When two litters are to be obtained annually, possibly the most suitable months for the litters to be born are January to March, and July to September. In herds where contracts are made to supply regular numbers of pigs to butchers or bacon factories, it may be found necessary to have sows farrowing all through the year, but wherever possible November and December should be avoided. The most suitable age for weaning pigs is 10 weeks—this allows the little pigs a very fair chance, and if the sow is served the first time she comes in season, which will be about the fourth day after the pigs are weaned, it will enable litters to be obtained at intervals of approximately six months.

The satisfactory rearing of little pigs is the most difficult part of pig-keeping, and on it depends to a great extent the success

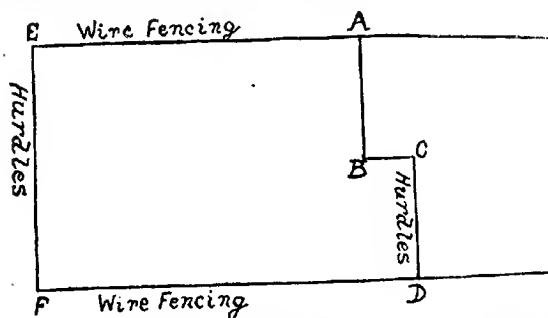
of the whole pig-keeping enterprise. The aim should be to keep the little pigs going on without check or disorder. If the sow has farrowed in an open hut with a run attached, the little pigs will soon venture out into the sun and exercise themselves. Exercise and fresh air aid digestion and sharpen the appetite, and when the sow is confined to a sty she should be allowed to go out of doors with her pigs as early as possible after farrowing, allowing for weather conditions. As soon as the little pigs will eat they should be fed apart from the sow with a ration which is specially adapted for them. With a little ingenuity, means can usually be devised for feeding the little pigs separate from the dam. In a yard or out of doors, the trough or feeder can be placed in a small enclosure made with four posts and rails so that the little pigs can get to the trough without the sow being able to steal their food. Unless the little pigs are on grass or arable crops they need green stuff or roots at the earliest age they will eat such food. When young pigs are fed in this way on dry food, and care is taken to provide them with sufficient liquid either in the form of water or separated milk, they seem to do better on dry than on wet feeding.

Open Air Pig-Keeping.—The fundamental principle of open air pig-keeping is that pigs are not confined to sties all the year round but are allowed out to graze either on grass, or arable land or in woodlands. Usually a hut or cheap shelter is provided. Open air pig-keeping was not common before 1914, but it had been practised in a few herds for some years previous to that date. The possibility of its successful application to commercial pig-keeping has now been generally recognised, and it has become the established practice in most commercial pig breeding enterprises.

When carried on in woodlands as is frequently recommended, there must be very considerable loss of valuable manure unless the woodland is made use of afterwards for some special purpose for which the residual value of the manure can be fully utilised. The possibilities of such use are not very great, and it would seem desirable that on a mixed farm pigs should as far as possible be kept on arable land. In the case of very poor grassland, however, pig grazing in conjunction with the judicious application of artificial manures, notably basic slag and lime, has brought about marked improvement.

There is an absence of exact information on the economic side of arable land pig-keeping. On the technical side it has been demonstrated that a suitable succession of crops can

be grown, and the pigs managed successfully while folded on them. Arable land pig-keeping has been carried on with success by Mossrs. Wilkin & Sons, at Tiptree for some years,* and it is now being practised to a considerable extent throughout the country. Generally speaking, the same crops and conditions which are found suitable for the folding of sheep will be suitable for the folding of pigs. Pigs show a preference, however, for vetch mixtures, clover, lucerne and rape. They do not appear to care for turnips as grown in the Midland counties, but they like swedes. Helpful suggestions as to suitable successions of crops have been made from time to time by Stanley Wilkin in his publications,† and also by J. C. Brown in Harper Adams College Reports. A farmer should have no great difficulty in working out a succession to suit the circumstances of his particular farm, but where the results of local experience and experiments are wanted for guidance he should apply to the Agricultural Organiser for his county for information.



Mr. Wilkin states that a sow will eat 16 lb. of kale per day, a six months old pig 10 lb., and a four months old pig 8 lb. Our investigations with regard to green and root crops generally, would tend to show that, making an allowance for trampling, rather higher quantities will be accounted for, say, 20 lb. in the case of the sow and 12 to 14 lb. in that of the six months old pig. The table given on p. 711 of this *Journal*, November, 1923, will show the rate at which these quantities of forage crops will replace mixed meal in feeding. Taking the above figures and the average or estimated yields of different crops, a simple calculation will show the acreage required for a given number of pigs. If we take an average crop of thousand-headed

* See this *Journal*, August, 1920, pp. 456, 457.

† Stanley Wilkin's Annual, 1923-4, 1/- post free.

kale as 16 tons per acre, 14 sows each consuming and trampling 20 lb. per day would use $2\frac{1}{2}$ cwt. daily, or 1 ton in 8 days. One-quarter of an acre of kale would therefore supply green food for the above number of sows for 32 days. In-pig sows eating this quantity of green stuff would need in addition about 2 to 3 lb. of mixed meal per head per day according to their condition.

The fencing of pigs on arable land may present some difficulty. Iron hurdles on wheels are satisfactory but they are expensive, and it is suggested that the fold be laid out with two parallel rows of pig wire fencing, and wooden or wattle hurdles used crosswise (see diagram on p. 796). To give a fresh supply, the hurdles A, B, are moved forward to give a straight line with C, D. Next day the hurdles C, D, are moved forward and the hurdles C, B, again inserted, and so on.

Shelters on runners which can be moved by yoking a horse to them are found most convenient for folding where frequent changes are necessary. To secure the uniform distribution of manure, it is essential that the huts and feeding troughs should be moved at frequent and regular intervals, preferably daily.

We do not favour the keeping of pigs in small enclosures with permanent grass runs. These grass runs are apt to become very foul and muddy in winter or during a prolonged period of wet weather, especially near the huts and feeding troughs. It has been found that foul runs may become infested with worms which are parasitic in the pig. Further, in summer it may be difficult to keep the grass closely enough grazed. It is better wherever practicable to give pigs a considerable range on grass-land and if due consideration is to be given to the improvement of the herbage, grazing with other classes of stock will be advisable at intervals. It is most important that the grass should be cropped down bare at least once a year. Grazing with stock other than pigs, or mowing, may be employed to secure this end.

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THE TEACHING OF AGRICULTURE.

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 Department of the Ministry of Agriculture.*

*The substance of an address given by Sir Daniel Hall to
 the Agricultural Education Association at Aberystwyth on
 10th July, 1923.*

I CANNOT help feeling that the object of my remarks is still somewhat in a tentative condition, and it may be better if I reserve a formal exposition of the subject so that all I have to say may be regarded by way of stimulus and suggestion rather than a direction to a particular action that I should like to see taken. This must be the case with all good teaching. The teacher has to work out a method, that method may not be a good one for universal adoption, but if a man has worked it out for himself and is keen, the very fact of his keenness may make that method an extremely profitable one.

Closer Consideration of the Method of Teaching.—What I have to bring before you is this, put broadly, that the actual method of our teaching, whether we teach inside the college or the farm institute or whether we teach in the county, requires more consideration than it ordinarily gets. We all of us in this country begin teaching agriculture in a thoroughly haphazard amateurish fashion. We go to college and later on when we leave, we find ourselves put in front of a class and required to teach on our own account. I think most people's experience would be similar to mine; no one gave me a hint or suggestion of what methods to follow—I floundered about and tried one method after another.

Many scientific and technical men have a certain scorn for what generally may be called the art of exposition, whether in speech or writing. In writing I have often occasion to deplore the style and quality of the written matter that is put out. In teaching I have from time to time listened to lectures and classroom instruction, and I do think the teaching might be enormously improved if the men thought a little more about this matter of teaching as an art in itself, independent of the material that is to be set forth, an art which has a code of rules and laws of its own. I do not want to lay down methods at this moment. Every man will think out his own method, but I do want to plead for a consideration of the method itself

as something worth thinking about, something by which the work—whether it is in classroom or lecture room—can be made more effective. I want you to take it that teaching is not a process into which you drop quite naturally, that it only involves the doling out of so much information to be got up by the class, whereby all the teacher can be expected to do will have been accomplished. If that were the case, if there were nothing in the functions of the teacher but to hand out a certain amount of knowledge, why have any oral teaching at all? Why not content oneself with books, or with some kind of organisation like the correspondence college? The organisation of a correspondence college for example can show the student exactly what he ought to read, it can set him papers, mark and comment on them. The way these colleges flourish proves that they can be effective in promoting the acquisition of knowledge for examination purposes. In fact one must take it that the very existence of these correspondence colleges on a large scale points out that there is a defect in the ordinary teaching given in the country. If the oral teaching were of the right kind the correspondence college, which gets its results and could not live if it did not get its results, would go out of existence.

To give an illustration of what I mean; you are all familiar with one of the very commonest forms of classroom teaching in University or University College—the lecturer who practically dictates to his students a certain text which he has prepared. The lecturer prepares very carefully his lecture as a résumé of a particular section of the subject and delivers this from the platform so that every student may take it down verbatim and get it accurately transcribed into a notebook. That form of instruction is very popular, especially amongst students. It supplies them with a short cut to knowledge; it absolves them from the necessity of reading anything other than their notes. They need not buy text-books; still less need they compare the different views of other people on the subject, and they regard this as a very profitable form of instruction. If they get up the notes which the professor has given them they expect to be able to pass the required examination. One knows the type of lecture notebook which is produced in that way, and I believe in some of the Universities it has considerable financial value. That always reminds me of a story of a Cambridge undergraduate in the time of a very famous coach known as Big Smith. The undergraduate had just come into residence and was taking counsel with some senior friends

as to what course to pursue, should he read for Honours or a Pass. He asked what was the difference between a Tripos and a Poll degree. The old hand replied "if you go for the Tripos you go to Brown, of Trinity, and he tells you what he thinks about it; then you go to Jones, of Jesus, and he tells you what he thinks about it; then you go to Tomkinson, of Caius, and he tells you what some other Johnny thinks. If you take a Poll you go to Big Smith and he tells you what it is." That is the attitude of the typical undergraduate; he wants positive knowledge delivered to him in neat little packets ready to be handed over the examination counter. I submit, however, that the teaching of that kind will eventually be replaced by the gramophone. It would be cheaper to the University to replace such professors by gramophones.

Of course there is the converse of the process, where the lecturer refuses to allow his students to take a note at all. That was my own practice in the later days of my actual teaching career. I was asking my students for their attention; I did not want them to divert their attention by taking notes. The object of my lecture was to impart a point of view and to get my students to apprehend the principles of the subject. So far as notes went it was my practice to issue a typescript at the end of the lecture, which contained subject headings, tables and diagrams, and references to the text-books indicating where details of the matters dealt with could be found. I do not say mine was the right way but it was an attempt to teach, whereas the other way is only an attempt to supply information. I throw out that as an illustration; the point I want to make is that the mere process of teaching does require thinking about.

On the other side let us take the outside lecture, the lecture that every college or institute teacher is required to give from time to time to audiences in villages and country centres. As a rule the preliminaries are organised for him; he walks into the place and is rather apt to suppose that if he delivers the lecture and the people do not leave the room in too large quantities during the process, that his method is good. If the audience falls off during the lecture course, he blames the organisation.

But we have to ask ourselves whether the lecture method is suited to the village audiences at all, whether the type of teaching we have to do in the counties has not got to start from an entirely different point of view. I want to suggest that

the prime effort of the extra-mural teacher must be in some way to drag the members of the audience into the fray themselves. They must be led to become active participators in the process of education. You have not much time in dealing with an audience of that description; you are running over the whole of agriculture, perhaps in six lectures and you only have time for stimulus. The technique of the process by which you can get your pupils to read and work for themselves does require a good deal of consideration. Put yourself the question, "How am I to get my audiences to help themselves? I, in charge, can only help people, I cannot teach them; I can only point out the lines upon which they can teach themselves."

How we can Improve our Methods of Teaching.—I take these as illustrations of the kind of subject I should like to see discussed, the methods of teaching inside and outside the college, how, by thinking for ourselves, we can improve our own methods. I want specifically to suggest the question of how the subject of agriculture itself ought to be treated in our Colleges and Farm Institutes, etc., because there I can see perhaps the greatest opening for better technique and indeed for some considerable reconstruction of our aims in teaching agriculture.

I think we are inheritors in this country of rather a mistaken tradition. I know quite well 30 years ago when colleges began to start in Great Britain for the teaching of agriculture, the general idea of their founders was that agriculture could be regarded as an assembly of applied sciences. There was chemistry, botany, zoology, geology and so forth, all sciences throwing light upon the growing of crops and the feeding of animals. If we first taught these sciences to agricultural students and then the application of those sciences to agriculture, we were teaching agriculture. You may remember that the first Cambridge diploma did not proceed further than that. It was content with an examination in applied sciences and treated agriculture itself as one of those rather mechanical extras which are pursued in practical life but which should hardly concern the university. So I think we were given a set towards the treatment of agriculture as just an assembly of applied sciences, and it was conceived that we could bring out a farmer by grounding the youth thoroughly in chemistry, botany, zoology and so forth.

Now agriculture is a subject *sui generis*, something quite distinct from an applied science; it has its own technique and

methods and its own fundamental science, which is neither chemistry, botany nor zoology, nor anything of the kind popularly termed science. It is accountancy which lies at the basis of the teaching of agriculture, and as pure chemistry is the grammar of the agricultural chemist and botany of the agricultural botanist so is accountancy the grammar fundamental in the instruction of the farmer.

The Object of our Teaching.—If we start off with that somewhat one-sided statement we shall get a little nearer to what is the right form of teaching. Let us begin by asking ourselves what we are after when we are dealing with the young men in an agricultural college. What is our object; what are we going to try and turn out? I think it is agreed that we are not thinking of turning out teachers, officials or that kind of man; we are thinking really of turning out a thoroughly equipped farmer and we want to ask ourselves what we mean by that—a thoroughly equipped farmer under modern conditions, and how we can help to ensure that type of man by education. We know well the old farmer who has no education behind him; he tells the teacher that no-one can learn farming in a classroom and that he has no opinion whatever of book farmers. The answer is not easy, but I think we can remove that kind of reproach if we take our teaching of agriculture from a somewhat different angle. What he means is that success in farming depends upon a number of qualities which are personal and many of which are only obtained by experience. If a man has no will or determination, if he lacks a certain firmness about making a bargain, of course he cannot become a successful farmer—and none of the efforts of the educator are directed towards giving these qualities.

Still, putting aside these inborn faculties and the essential matter of experience, what does characterise a good farmer as distinct from a bad farmer? We can sum it up in one word—management. The good farmer not only knows what work has to be done, what good work is, the technique of growing his crops and breeding cattle, etc., but he knows how most effectively to dispose of the staff of labour that he has on that particular land. His job as farmer is a manager. The agricultural college is dealing mainly with men who are going to be managers of labour, directors of other people's work. They are not going to do manual work themselves, except perhaps in their younger days, but in the main they are going to be heads and not hands.

Developing the Idea of Management.—When you turn to compare the successful with the unsuccessful farmer you will probably find in a great many cases that the question of financial success depends upon this disposal of labour more than anything else. We may sum up the object of the agricultural college as the training of managers. That being the case what I want to submit to you is that we must direct our teaching to that end.

Suppose we turn to one of the most successful text-books on agriculture that we have in England, the late Professor Frearn's—almost the only widely distributed text-book that has been written in English on agriculture—do you find that point of view, management, set out from the beginning of the book to the end? There may be an odd chapter or two about it, but in the main the book is concerned with the description of the materials of the farmer. You are told how to discriminate between fescues and poas, hop trefoil and yellow clover—just the kind of things that are so much taught and learned by the agricultural student and so heartily despised by the old type of farmer. The old farmer is wrong; you cannot know too much of anything. None of these descriptive points are without their value, only they cannot replace the other things, the vital study of the economics of a farm and its management. That is the point that I want to bring forward in these remarks.

The teaching of agriculture as I have seen it, and I speak from experience, is far too much a mere matter of description. It may not even be descriptive of the kind of farm the teacher knows himself, it may be a discussion on the old systems of farming. It is not unknown that men continue to teach the East of Scotland form of agriculture as described in Stephens' "Book of the Farm" as the only method of successful farming. It may have had little to do with the farming that was going on round about the college, having been worked out on a different rotation and for a different soil and climate. Let us have done with this purely descriptive teaching of agriculture.

The teaching of agriculture should be to an increasing degree a matter of personal experience, and it should be in every district largely based upon what is going on round about the college. It should begin as a description, so far as it is descriptive, of the farming practice amongst the people the student comes from; that is the first thing; let us localise our teaching. In this way the teacher can introduce the element of personal

investigation; he begins by finding out what the people round about are doing, that will lead him to comparisons of their methods with other people's methods. He can fall back on the standard system of his text-book, compare it with the local system and discuss the difference that he finds between the two. The critical faculty is brought into play.

But we must go a step further if we have in view management, so that the student, when he leaves college and begins to work on his own account, shall be in a position to be critical of the work that he gets done, and not merely in the hands of his foreman or bailiff. We must not be content merely with describing. We must ask ourselves about each of the processes, how many men, how many horses, how much time, what will it cost step by step, and criticise these costs in the light of the results. Here the real critical process comes into play. The agricultural teacher dealing with, say, the potato crop, should have acquired for himself, by direct observation, a picture of the practice of a successful potato grower under certain conditions. He has followed the crop through, he has found out the number of men at work and the amount they did, and he is in a position to sum up the costs. That alone is a description which may be a great help to a student later on. But if he can set alongside that a description of the methods of two other equally good farmers and in different districts with the details of the alternative operations, the number of men on the job and the costs. I should think he is entering his students in the art of being managers. That is the first step. It has not got to end there.

After the teacher has been through the raising of crops and the treatment of livestock as individual operations, he has got to get his students into a perception of how a really good farmer schemes out his work from week to week, and how, given a certain staff at his disposal, he uses them to the best advantage. From my own observation of practical farming there lies the difference between the successful and the bad farmer—the way in which a good farmer has his work planned out and with a given staff always is ready to throw in his strength at the right moment. Of course you cannot teach that, but you can awaken the student very much to the necessity of thinking it out for himself.

It is in that connection the college farm is going to be most useful for the purpose of the teacher. The college farm should be run as a practical business proposition which is illustrating management and which is a text-book of the teacher in the

lessons he is giving. Every student should keep an exact diary week by week of the operations that go on on the college farm, and it should be a diary with full details. It does not record "March 15th, sowing barley on the 10-acre field." No, he says "sowing barley on the 10-acre field; wheat stubble ploughed in November, wanted more frosts, a little stale on top and wet below." Then should follow the operations, the horses and men to each and the time taken. Further, the teacher should be giving the actual cash transactions from week to week. The teacher taking his class on Monday morning will say "our business during this week is so and so, I propose the men shall do so and so," and he shows them how he has schemed out the use of his staff during the week and the alternative in case the weather is unfavourable. It is in this way we can make our agriculture itself scientific, and not merely descriptive of accessory scientific facts which may be of value but which are of secondary importance compared with the question of management.

When we get on to the second and third year of teaching we have to consider broader economic questions; the reason for this or that branch of the business, why we are producing milk, why we are fattening bullocks, etc. We can begin with a consideration of the policy of the college farm, for it is the one which is close at hand, the one about which the teacher has the most details. But neighbouring farmers are generally willing to help the college by disclosing enough of their accounts to give the teacher materials for the discussion of policy. Now this means that agricultural teaching should be founded upon a system of cost accounting. The future of efficient management depends fundamentally upon a good book-keeping system to begin with, and the constant use of that book-keeping to check operating costs, so I think that the student must be inducted early into the point of view of cost accounting.

We are apt sometimes to assume that we can describe the right method of farming. I do not think there is a right method of farming, there is only a best compromise to adopt under given circumstances as regards soil, climate, markets, etc. The teacher's object should be to get the student into a critical way of examining other people's work so that eventually he will pass on to criticise his own work. The machinery for this is only to be supplied by a sound system of costing. Therefore the teacher of agriculture should investigate costs for himself so as to establish a comparative system of teaching, comparing

A's methods with B's methods and discussing with his class how relatively they arrive at the same ends though one may cost a little more. He is then in a position to criticise the whole conduct of particular farms, always with the management in view, and the results in cash as the fundamental test of the rightness or otherwise of the operation.

I do not think I need say anything more. I could have elaborated, but I rather want to throw out these suggestions for you to turn over for yourselves and see if they will not strike on your box and modify the methods by which you teach. I am convinced that if you think about these points of the technique of teaching, you can make your work more effective.

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THE AGRICULTURAL SITUATION IN THE UNITED STATES.

THE rapid fall in prices, particularly of agricultural products, that has taken place since the War, has been experienced with at least as great severity in the United States as in Europe. So seriously have the depreciated values of its produce, as compared with the costs of growing it, affected the farming industry, that the United States Government last spring called a conference of economists and others to examine the situation. Four Committees were appointed to deal more especially with the prospects of foreign demand for American farm products, the prospects of the home demand, the position of the hog industry, and wheat growing. These Committees submitted reports, and a second conference in July last approved these reports and drew up a general summary of the situation. The following notes represent the conclusions of the conference: the data given in the reports have been reproduced, but more recent estimates issued by various Governments are given in brackets, so as to bring the information down to the latest date.

Wheat Situation of the World.—A current crop for the Northern Hemisphere moderately larger than that in 1922 is indicated. The Committee report that this increase represents only a small percentage, adding the caution that it might be entirely wiped out, or on the other hand augmented, by later developments in North American spring wheat or in the crops to be harvested early in the New Year in Australia and Argentina. (This caution was justified, for later reports

regarding the crop in Canada point to a harvest considerably greater than was then anticipated.)

In the United States this year's production of wheat was in July forecast at 440 million cwt. (the October estimate puts it at 419 million), as compared with 462 in 1922, and a pre-war average of 370 during 1909-13. The Canadian crop was regarded as probably being in the neighbourhood of that of last year (latest indications make it 37 million cwt. greater), when it was 214 million cwt., the pre-war average being 106 million.

In Europe, judging by those countries for which data were available, it was expected that there would be an increased production of 63 million cwt.; while North Africa would yield 13 million more; in India and Japan there was an increase of 18 million. (The latest data point to an increase over last year in Europe, excluding Russia, of 131 million cwt.; North Africa also has better prospects, while little change has to be recorded in India.) Taking all these figures together, the increase in the Northern Hemisphere was in July estimated at about 72 million cwt. (latest returns indicate 150 million cwt.). In the Southern Hemisphere, where seeding was going on at the time of the report, an acreage about equal to last season's was expected to prove a reasonable estimate (the latest Argentine official estimate is for an increase of over a million acres in that country).

While European production is higher than in 1922, the latter year was over 100 million cwt. below 1921; nevertheless, Europe only imported about 27 million more in 1922-23 than in 1921-22. The difference between crop deficit in 1922 and increased imports was apparently made up by (1) greater rye and potato consumption, (2) closer milling extraction, and (3) a probable reduction of European wheat stocks.

As regards Russia, the Conference consider that, while reports are conflicting, it is probable that the areas of wheat and rye this year are about one-half the pre-war totals, whereas the population is two-thirds of the pre-war population. With normal pre-war consumption this would admit of little or no export. Lack of farm animals, machinery and fertilisers, together with poor transportation, are factors indicating that Russia will not export large quantities of grain in the immediate future.

Owing to the world war there was a very great increase in the wheat acreage of the world, outside Russia and the Danu-

bian countries. Before the War, Russia, Rumania and Bulgaria exported more than 100 million cwt. of wheat every year, or about 90 per cent. of all the wheat exported by exporting countries. Owing to the isolation of these sources of supply during the War, the acreage in four of the five other principal exporting countries increased; since the War it has decreased again very slightly. The changes are shown in the following table (thousands of acres):—

		<i>Pre-War, 1909-13.</i>		<i>War Peak, 1918-19.</i>		<i>1923.</i>
United States	... ..	47,097	...	67,437	...	58,233
Canada	... ..	9,945	...	18,240	...	22,165
Argentina	... ..	15,799	...	17,425	...	15,081
Australia	... ..	6,793	...	8,882	...	9,804
India	... ..	29,043	...	29,642	...	30,492
TOTAL (5 countries)		108,682	...	141,826	...	136,795

These five countries are growing 28 million more acres of wheat than before the War; and this considerably more than replaces the pre-war surplus from Russia and the Danube.

The five principal importing countries of Europe (United Kingdom, Italy, Germany, France and the Netherlands) whose average pre-war area was 34½ million acres under wheat, are now growing about 31 million acres, having recovered to that extent from the low point of 26 million acres reached during the War.

It is concluded that the expansion in the wheat area of the chief exporting countries, coupled with the decreased buying power of Western Europe, is responsible for the price situation which now prevails. It is also stated that significant changes have taken place in European methods of purchasing wheat. Before the War, wheat was bought in large quantities shortly after harvest for either immediate or forward shipment. Owing to the straitened financial conditions of European consumers, and difficulties incident to a fluctuating exchange, there has developed a tendency to purchase more largely from hand to mouth. This increases dependence upon American storage and financial facilities, and suggests the necessity of producers, bankers and handlers considering the advisability of more gradual movement from the farms to meet the new methods of foreign purchase.

The Conference conclude with the suggestion that the American wheat grower should take the first positive step this autumn to adjust his winter-wheat acreage in accordance with the world situation. This amounts to a recommendation

to American farmers to reduce their wheat acreage. Since this Report was issued, an inquiry conducted by the Department of Agriculture among 25,000 farmers has elicited replies to the effect that they intend to reduce their winter-wheat area by $15\frac{1}{2}$ per cent. If this were done by all farmers, it would imply a total area under winter wheat in the United States of some 39 million acres, whereas in the autumn of 1922 the acreage sown was over 46 million acres, of which 39,750,000 proved to be ultimately harvested, the balance (a higher proportion than normal, however) having been abandoned owing to "winter-kill." If the farmers carry out their intentions, and if only the average area is winter-killed, it would imply an area of rather over 35 million acres actually bearing a crop.

Maize and Hog Situation.—A special pig survey was taken on 1st June, from which it appears that there was more breeding this last spring than in 1922; also inquiries addressed to 140,000 farmers elicited the expressed intention to breed 28 per cent. more sows this autumn than in 1922. Probably the amount of breeding will be less than the expressed intention: last year the increase was only about half that stated in a similar inquiry. These investigations have revealed that hog producers in the United States are inclining toward autumn-breeding, making for a more even distribution of marketing throughout the year. The spring farrowings showed also that while the increase is due to increases in the Corn Belt (i.e., the area in which the bulk of the maize is grown) and the western States, many of the important cotton States this year showed a decline, cotton apparently replacing some of the maize and peanuts there. As the indications given by the similar survey last year proved on the whole well founded, it would seem that, on the basis of this year's survey, provided that the mortality is no greater now than last year, the commercial market supply of hogs (over four-fifths of which comes from the Corn Belt) from the spring crop of 1923, should be about as large as that from the spring crop of 1922. If expressed intentions as to breeding are carried out, to the extent of half, as last year, the autumn crop of this year, which will be marketed next summer, will be larger than that of last. However, recent developments may cause farmers to market during July and August a considerable number of sows that they had intended to use for breeding this autumn.

During the last year or so, more hogs have been marketed than in any other like period in history, eight months' records.

showing an increase of 30 per cent. over the previous year, and 60 per cent. over a corresponding pre-war period. This greatly increased production has been due to the large maize harvests.

The maize crops of the last three years have been unusually heavy, and the price has been very low. To utilise the large surplus of cheap corn, hog production has been greatly expanded. This increase in hog production has now cleaned up the unusual surplus, with the result that the stocks of 1922 maize on farms were in July at about the pre-war average, and prices have recovered from their extremely low point. July prospects were for a normal 1923 corn crop (according to latest official statistics these prospects are somewhat improved). Thus the corn situation does not warrant the maintenance of the very heavy hog production of the past year; and if it is maintained, a maize shortage may develop by the summer of 1924.

The history of the past fifty years indicates that there is a rough general tendency towards over—and under—production of hogs in cycles of about 4 years from maximum to maximum. From the autumn of 1920 until that of 1922, hog prices were high relatively to maize. This high "corn-hog ratio" stimulated heavy breeding, with the results that hog prices fell until now (July) they are 25 per cent. below the 50-year average ratio. In spite of this sharp decline heavy breeding has continued, with the prospects that the unfavourable "corn-hog ratio" of the past months will last into 1924.

Considering the demand for pork and other pig-products, the Conference notes that the quantity in cold storage at the moment was not particularly excessive, and thus they conclude that there is no slackness in the demand. In the case of lard, stocks were below average, and thus the outlook for this was quite favourable. The population has already this year consumed 5 lb. of pig-products per head more than in 1922, and if this is maintained it would imply an annual consumption of 85 lb. per head, an amount only once exceeded 15 years ago. This heavy consumption may be expected without further serious decline in prices, since the active employment of labour has supported the pork market far beyond what might have been expected from a consideration of the heavy hog production. The ability to do so in future depends upon the maintenance of favourable industrial conditions.

The foreign demand for pig-meat has been unexpectedly large. The export trade takes approximately 10 per cent. of

the total United States pig-products, and Europe has this year taken a decidedly larger proportion at a higher price than seemed probable. England and Germany still remain their principal customers, with considerable quantities also going to Belgium and the Netherlands. Britain's imports of lard have decreased, but the Continent has been taking more.

While the foregoing considerations indicate that the last of the 1922 pig-crop will be readily absorbed by the present market, the selling of this year's pig crop at a price on a level with the crop of 1922 is more problematical, and will depend on the continuance of active employment of labour in the United States and a favourable condition of the European market. The maintenance of the very heavy rate of pig production of the past year does not seem warranted by the maize situation.

In considering the domestic demand for farm products generally, apart from the two special factors just dealt with, it is pointed out that two facts stand out very clearly. The first is that there has been in the United States a very high level of industrial activity, distribution and consumption. Within the last twelve months the general level of prices has been fairly steady, the changes actually noted not being regarded as materially significant. The second fact is that throughout this period of great prosperity, the prices of most farm products, with the exception of cotton, and latterly of corn, have been abnormally low. The farmer, in marketing his produce, has had, much more than the manufacturer, to meet world conditions; and as a result agriculture has not generally shared in the marked recovery in 1922-3 in the United States. Owing to the general prosperity, the home demand for farm products has been near to if not at a maximum; the people can scarcely consume more of wheat and meat and other produce than they have done in the last year or more. The farmer therefore cannot now expect any immediate increase in the domestic demand. On the other hand the present full volume of employment and high wages are maintaining the consumption; and the probability of any severe depression in the near future seems to be slight; while lessening of industrial activity would probably affect only the demand for the choicer products, perhaps even thus increasing the demand for the cheaper grades of food. It is concluded, therefore, that, so far as domestic requirements are concerned, there is no special reason to expect a sharp decline in the average prices of farm products.

As regards foreign demand, European countries constitute the only significant markets for American agricultural products; and the position in the future depends mainly upon three factors: (i) the essential food requirements, depending partly upon crop conditions in Europe, (ii) the competition of other food-producing areas, and (iii) the purchasing power of Europe.

The European nations are gradually approaching their pre-war level, especially continental importing nations. Data showing this in the case of wheat have already been quoted. Crop conditions in Europe generally are much more favourable this year. Revival of production in Europe is much more manifest in agriculture than in manufacture.

In estimating the probable demand for American foodstuffs, adverse economic conditions may seriously reduce the consumption even of essential foodstuffs. Figures are given indicating that Germany's consumption of wheat in 1922 was only 55 per cent. that of 1919 and rye but 60 per cent. Barley and oats were but a third or a half, while potato consumption amounted to 93 per cent. There appears here a shifting from bread to potatoes. The extent of this shift is greater than the figures indicate, for it is stated that less potatoes are fed to pigs and more are reserved for human consumption. It is also stated that a similar shift is being made in many other countries of Europe.

Europe's purchasing power will depend upon the volume of her exports, the amount of her earnings on investments abroad, on shipping and other services, and on credits. The United States send more goods to Europe than they receive from her, though the balance has of late diminished moderately. There appears to be a shortage in the European production of manufactured goods—such as America requires—and moreover there is an increasing reluctance, as manifested in the tariff laws, to receive European goods. These factors, coupled with the Ruhr situation, and the necessity of the British Government to make large remittances on account of the nation's war debt to America, are all regarded as factors inimical to European buying power; and the conclusion is drawn that, unless the Ruhr situation is speedily cleared up, and a definite turn for the better taken place in Europe, there will probably be less foreign demand for American farm products this season.

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CO-OPERATIVE CHEESE-MAKING CENTRES IN SUSSEX.

R. H. B. JESSE, B.Sc., N.D.A.,
Director of Agriculture for East Sussex.

CHEESE-MAKING in Sussex on modern lines is of quite recent origin; in fact the production of milk itself on a large scale, now the most extensive branch of the agricultural industry of the county, is also a development which has come about practically within the last half century. Hence, the introduction of the first large dairy herds, kept primarily for milk production, is well within the memory of many still farming in the county. Until late years the demand in East Sussex for fresh milk has kept pace with the increased supplies available. The requirements of London and the south coast towns made it unnecessary to convert any appreciable amount of milk into either cheese or butter. It is true that on many of the smaller Wealden farms butter was made, and is still made to a limited extent, but the large producers of milk depended entirely on the sale of liquid milk.

For some few years before the war, however, the supply at certain seasons exceeded the demand, and this situation has now become intensified and is likely to become still more acute.

Factories and retailers have hitherto generally taken the total output of the farmer at a fixed price, and under such conditions the price paid to the farmer was a price which enabled the retailer to recover any loss sustained in dealing with surplus milk which he could not profitably utilise. At the present time, however, most of the contracts entered into between producer and buyer are such that surplus milk is paid for at a rate which depends on the price of imported cheese. In Sussex the situation had therefore become more difficult than in many counties which have long been associated with the manufacture of cheese. In the western counties it has for years been the practice of milk producers to sell milk when satisfied with the price that could be thus obtained, sometimes throughout the year, but frequently only during the winter months. Such producers were thus always in a position to make the best possible terms with their buyers owing to an alternative outlet.

Demonstrations by the Agricultural Education Committee.

—The unusual position of a county where supplies were tending to exceed the demand, and where alternative outlets did not

appear to exist, was a factor which induced the East Sussex Agricultural Education Committee to adopt the Ministry's scheme for co-operative cheese centres. It is not an easy matter, however, to introduce innovations with rapidity into established agricultural conditions, so that before co-operative cheese-making centres could be successfully established, a considerable amount of preparatory work had to be carried out.

In 1918 cheese-making was started on a very small scale. Peripatetic work was undertaken dealing with quite small quantities of milk, the capacity of the vat used being only approximately 40 gallons. This peripatetic work, however, was sufficient to create an interest and also a favourable atmosphere.

The next step was to demonstrate at the County Farm, Plumpton, that it was a fallacy to imagine that first-class Cheddar cheese could only be made in such fertile districts as those existing in the west of England.

At the county farm, as on the majority of Sussex farms, no suitable place existed for making Cheddar cheese. A home-constructed dairy was, however, equipped out of part of a cart-shed. All work in equipping this dairy was done by the ordinary labour on the farm, except the installation of a boiler and steam fittings, etc.

In addition to making into Cheddar cheese the milk produced on the farm, milk was purchased from adjoining farms, and during the months when the adjoining creamery could not readily deal with this surplus milk, Cheddar cheese was made. At the termination of the cheese-making season, the milk was sold at very favourable terms as accommodation milk.

In order to create further interest in the work, a large quantity of the cheese was sold by auction in Lewes market.

Despite the disadvantage of the roughly-equipped dairy, Cheddar cheese of very high quality was made, and the demand far exceeded the supply.

In 1920 some of the cheese made was exhibited at the Sussex County Agricultural Show at Chichester. In 1921 a considerable amount was again exhibited at the same Show at Hove, whilst at Hastings in 1922, the Sussex Agricultural Society awarded a special diploma for an "excellent exhibit of cheese." In 1923 at the Sussex Show there were 15 exhibits of Cheddar cheese, the first prize being awarded to that made at the county farm, and the second to the Hurstpierpoint centre. At each of these agricultural shows efforts were made to popularise the idea of utilising surplus milk for Cheddar-cheese making.



FIG. 1.—Lewes Co-operative Cheese-making Centre.



FIG. 2.—Press Room at the County Farm, Plumpton.



Hassocks Co-operative Cheese Centre, Hurstpierpoint.—In 1921 the Hassocks Branch of the National Farmers' Union, which embraces within its area the county farm, decided to establish a co-operative cheese centre at Hurstpierpoint. An old brewery was obtained which was equipped partly with the apparatus provided by the Ministry under its scheme, and partly by the guarantors of the centre. In order to provide working capital, the supporters guaranteed an overdraft at the bank. During the contracting period, at the end of March and the beginning of April, when some difficulty was being experienced in the district in disposing of milk, the centre was working up to its maximum capacity, but as soon as contracts were fixed, the centre temporarily closed until there was again a surplus of milk in May and June. The centre then re-opened and dealt with all the surplus milk available.

The work at this centre was supervised by the county instructress, whilst the local branch of the National Farmers' Union provided assistants who were trained with the object of conducting the centre when county assistance should be withdrawn.

Owing to the initial capital cost of equipping the centre with boiler, steam pipes, cheese racks, etc., the members could only pay out at the rate of 7d. per gallon for milk supplied during the first season.

Lewes Co-operative Cheese Factory.—The activities of the Hassocks Branch of the National Farmers' Union caused the adjoining district at Lewes in 1923 to equip a centre similar to that which had been so successfully run at Hurstpierpoint. In Lewes considerable difficulty was experienced in finding suitable buildings, but eventually room was found in another disused brewery. Such buildings may have been ideal for the production of beer, but very considerable difficulty was experienced, but eventually overcome, in adapting them for cheese-making.

The cost of equipment at the Lewes centre was appreciably lower than at Hurstpierpoint owing to the fact that steam could be obtained from a boiler originally used in connection with the brewery. In order to minimise expenditure in every possible way, the centre was equipped as simply as possible, partly by the supporters of the scheme, but chiefly by the apparatus provided by the Ministry, so that in May, 1923, the centre was able to deal with all the surplus milk of the guarantors which, at the maximum period, amounted to 240 gallons per day.

At the Lewes centre, 9,124 gallons of surplus milk were dealt with, and to their intense gratification the guarantors found that in closing their first season's venture, they were able to pay out to the guarantors 1s. a gallon for all surplus milk sent to the centre. This remarkably satisfactory state of affairs was to some extent due to the fact that owing to the difficulty of buying Colonial cheese in June, there was a keen demand for English-made Cheddar. A considerable quantity of the cheese was sold unripened at 1s. a lb., and as in its green state nearly $1\frac{1}{4}$ lb. of cheese was made from a gallon of milk, and as the whey was sold at 1d. a gallon, the return from a gallon of milk was extremely good. Later in the season the price of English Cheddar rose considerably, and higher prices could be obtained locally than were being paid for similar grade cheese in the cheese-making districts, especially as the cheese sold in almost every case went direct from the cheese-making centre into the retailers' shops.

Revised Rules for Lewes Centre.—In establishing the Lewes and Hassocks centres, rules based on those recommended by the Ministry were laid down and generally were found to work quite satisfactorily, but the guarantors of the Lewes cheese-making centre have now decided to put their centre on a somewhat different basis, as the farmers supporting this centre feel that all the cost should not fall on those sending milk to the centre, especially when, as in a county like Sussex, the cheese-making period can generally only extend over a short period. The guarantors of the Lewes centre, therefore, have decided to extend their activities, and instead of defraying all expenditure in connection with such centres out of the milk actually sent, to pay general establishment charges by subscriptions from members.

The following particulars and rules were circulated by the supporters of the Lewes scheme at the termination of the first season's enterprise.

“The guarantors of the Lewes Co-operative Cheese Factory invite dairy farmers in the Lewes district to join with them in continuing and expanding the centre. They especially desire to point out to dairy farmers the following advantages of being connected with such a centre :—

1. *Surplus milk in April, May and June* can be made into Cheddar cheese. This enables farmers, usually, to not only secure a better price for their surplus milk, but also to obtain better terms from their retailers for their remaining milk.

2. The factory will be able to deal temporarily, at contract time, with unsold milk, thus enabling members to make the best possible terms concerning their milk.

The guarantors in connection with the above would point out that during the past season the centre has been very helpful to them and that instead of the guarantors receiving the prices of 10½d. and 7½d. payable for surplus milk in May and June, it is hoped that the guarantors will share out at the rate of 1a. per gallon.

The following are necessary rules and conditions in connection with the Lewes centre.

Guarantors must subscribe towards the rent and general expenses in connection with the centre at the rate of 2s. per cow, 1s. to be paid on the 1st October, and the balance on the 1st April, with a maximum of £5.

From the guarantors will be elected a management committee to deal with the work of the centre.

The management committee reserve the right to accept, or decline, surplus milk. Should they be unable to accept milk any subscription paid will be refunded.

The guarantors of the Lewes centre wish to point out that they have already equipped the centre and have obtained an option of a lease of the premises and, further, that as regards any additional equipment which may be necessary to deal with larger quantities of milk, a guarantor has advanced £100 for such equipment, which can be repaid from proceeds received at the centre extending over a period of three years.

The guarantors desire also to point out to dairy farmers that during the past season they have dealt with approximately 9,000 gallons of milk at Lewes, that there are similar centres run by the Hassocks and also by the Steyning Branches of the Farmer's Union. By supporting such centres dairy farmers will be rendering invaluable assistance to the dairying industry in East Sussex."

The guarantors of the Lewes scheme were confident that they could largely increase the number of members who would now support the Co-operative Centre, but they wish to have the benefit of another year's experience before embarking on what will ultimately undoubtedly be a much wider scheme of co-operation between milk producers.

In connection with the Lewes cheese centre, one of the most gratifying things has been the ready assistance of the local branch of the Women's Institute in disposing of much of the cheese made.

In the meantime, the work which had been carried out by the Hassocks Branch of the National Farmers' Union had aroused the interest of the adjoining branch at Steyning, which comes within the administrative county of West Sussex. At the commencement of the establishment of this centre, a student who had been trained in cheese-making at the county farm at Plumpton, carried on the centre until other arrangements could be made.

The cheese-making centres of Sussex which have, during the last few years, grown from such a small commencement, have not necessitated any large amount of capital expenditure to be borne by members. The buildings invariably have been of the simplest kind, whilst the amount subscribed under the Lewes scheme is such that farmers generally are willing to subscribe to it as an insurance policy enabling them to deal with surplus milk.

Further, such centres are not inimical to the interests of the retailers of milk; as a matter of fact two of the most prominent supporters are amongst the largest distributors in Sussex.

Since the movement has extended from Plumpton to the Hassocks, Lewes and Steyning Branches of the National Farmers' Union, it is the intention of the Agricultural Education Committee to foster similar centres throughout East Sussex wherever such can be established, as the Committee feel that no better assistance can be given to milk producers in this time of stress than enabling them, by providing technical instruction, to deal co-operatively with milk, on which so largely depends the prosperity of the agricultural industry in Sussex.

Ministry's Scheme of Assistance.—The development of cheese-making centres in Sussex could not have been carried out but for the assistance received in connection with the Ministry's scheme for aiding the formation of co-operative cheese schools.

It is probable that this scheme is known in most counties, but it may be useful to give a brief outline of it.

The Ministry, with the object of providing local demonstrations of the possibilities for co-operative action by milk producers, and of giving instruction in certain branches of dairy technique, has urged County Agricultural Education Authorities in whose area milk production is practised to any considerable extent, to conduct co-operative dairy schools at suitable centres where the local milk producers express a desire for assistance. A school located at an approved centre would operate for from three to six months, or until an adequate demonstration has been provided.

The local milk producers must agree to contribute on a co-operative basis for the use of the school, a daily quantity of milk—usually fixed at about 200 gallons, and must appoint from amongst themselves a local committee of management to act under the guidance of the agricultural organiser and the school instructor.

The Ministry lends to the authority most of the equipment, and contributes two-thirds of the instructor's salary and of other expenses incidental to the instruction. The Ministry's technical staff is also willing at all times to assist with technical advice.

It is of course not required that the farmers taking part in the demonstration shall subsequently form a co-operative society. They are left to form their own decision in the light of the results of the school.

It is not the purpose of this article to deal fully with the scheme, but all interested in such work are advised to apply for information to their County Agricultural Organiser or to the Ministry.

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CONSTRUCTION OF SILOS.

WALTER E. SAWYER.

Of late there has been much discussion on the cost and style of various silos, and it is felt that particulars and illustrations of certain types of silos may therefore be of some interest. With the exception of the last (Fig. 2), which was built of blocks and was put out to contract, all these silos were designed and built under the personal supervision of a thoroughly practical farmer, farming his own land. As regards the labour, that, too, was all untrained. The first silo was built with German prisoner labour, and without the use of scaffolding of any kind, but an internal ladder and jenny wheel. The others were built by men usually at work on the farm. The scaffolding used was suitable timber usually available on an ordinary farm.

Owing to varying wages the cost is given in hours or days, and materials in quantities, so that it is quite simple to work out the total cost at the present price of labour and materials.

The first silo illustrated (Fig. 1) was built with German prisoner labour, *in situ*, with forms 2 ft. 3 in. by 12 ft. 6 in. and 8 in. thick. The material used was 12 tons of cement and 60 yds. of shingle and sand. The mixture used was 1 part of cement, 3 parts of sand and 4 of shingle, reinforced both ways with old iron. It was built at the rate of three rings per week, to allow of the proper setting of the concrete. The bottom is drained and stands on gravel. The average labour was 5 men per day. The entire quantity of material was hoisted by a jenny wheel attached to a ladder inside. The total height is 40 ft. and diameter 16 ft., with an approximate capacity of 180 tons. This silo has a slightly domed top and openings at intervals at

the side, covered by a chute of galvanised iron, so enabling the silage to be thrown out as wanted, directly on to a wagon or tumbril. A fixed ladder runs the whole way up, joined to the silo within the chute. The material as cut goes up through an iron tube to the top of the silo, through a hole, and is then directed downwards from the centre through a flexible iron tube, so that it is equally distributed all over the floor. In practice, as the silo is being filled a man treads the material down as it is delivered out of the spout, and by directing the flow, keeps the material evenly pressed and prevents any looseness near the walls, which might allow of deterioration of the silage.

The actual filling of the silo is carried out by an ordinary Maynard chaff cutter adapted for the purpose. The knife delivers directly into a sunken receptacle with a blower attached which forces the cut stuff up the delivery pipe and through the hole in the top into the silo. The crop used in this case was from a mixture of 5 pecks of tares and 3 pecks of oats per acre, which yielded about 13 tons per acre. The filling took place continuously, only the nights and Sunday being left for settling, the amount dealt with being about 30 tons per day. Usually the silage is left for three months before being broached and then is fed to cattle and other stock. The owner considers the relative value of this silage for rough comparative purposes as roots 100, silage 175, or hay 100, silage 33. The amount of waste entailed by making the silage and through loss of weight is reckoned as about 5 per cent. of water and 3 per cent. outsidcs, tops, etc.

The second silo (Fig. 3) was built under exceptionally economical conditions. On the estate, within a few hundred yards of the farm premises and on the way to the town, there is a gravel pit. By cutting away back to a perpendicular straight wall it was possible to erect a 15-ft. silo, which could be filled from the top and emptied through the various side openings or windows into carts or waggons when required. In this case the rough sand and shingle were obtained as the site was excavated. The particulars of this silo are:—Height 15 ft., diameter 12 ft., capacity about 3,000 to 4,000 bushels of wet grains. This silo was built by two men in 24 working days. The forms used were 1 ft. 6 in. by 3 ft., making walls 4 in. thick and one ring every 24 hours. The mixture used was 1 part cement, 3 parts sand, 4 parts shingle, reinforced with old iron. The total cement used was $2\frac{3}{4}$ tons. As the sand and shingle came from the excavation and the labour is included in the 24 days of the whole work entailed of excavating, building, water carting, etc., this was

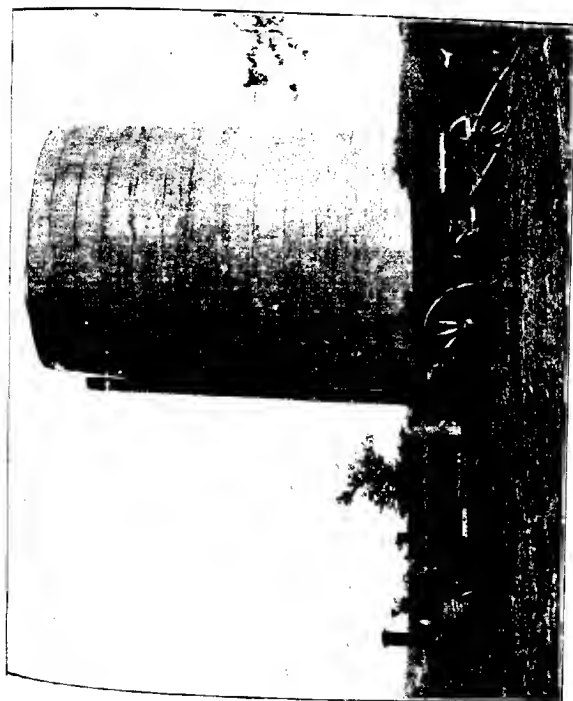


FIG. 1.—Reinforced Concrete Silo at Brimkom.

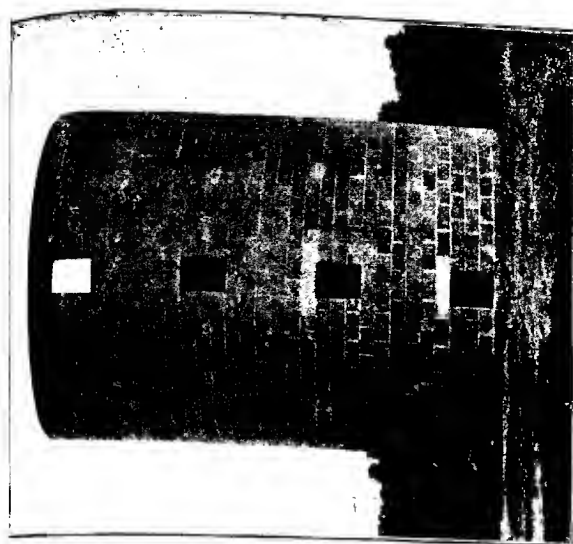


FIG. 2.—Concrete Block Silo at Belchamp.

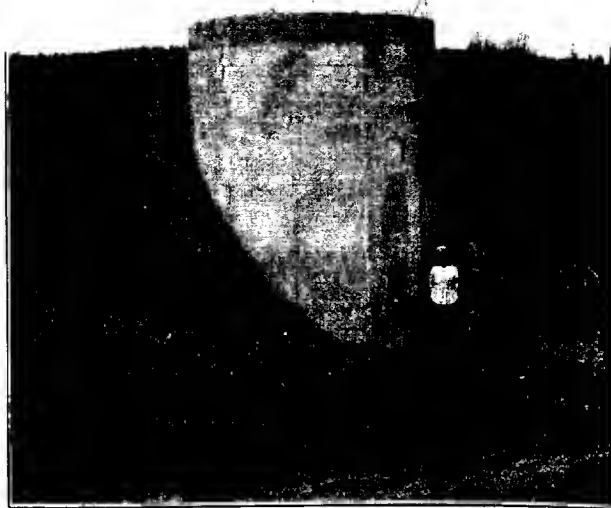


FIG. 3.--Reinforced Concrete Pit Grain Silo at Brundon.



FIG. 4.—Reinforced Concrete Water Tank at Brundon.

a very cheap silo. There are three windows or openings for emptying the silo. In this case the bottom is solid cement without drainage.

The grains ensiled here are bought during the cheap period when flush of grass makes them practically unsaleable, and stored for use during the winter months. The shrinkage, principally water, is about 10 per cent. The grains are used for cows, partly to replace concentrated food at the rate of $\frac{1}{3}$ bushel per day, a typical ration being 50 lb. silage, $\frac{1}{3}$ bushel ensiled grains, $\frac{1}{3}$ bushel fresh grains, 3 lb. concentrated food, and 7 lb. dry cut chaff.

Another silo (Fig. 2) was built on an off farm under contract on 1922 costs for £170. It is built of concrete blocks with horizontal reinforcing only. The blocks were made on the site and the mixture was about 5 parts sand and 1 part cement. The floor has drainage, but there is no roof. It is 30 ft. high and has a diameter of 16 ft., with an approximate capacity of 120 tons.

It may be of interest to add a note on the construction of a farm water tank. Fig. 4 gives an idea of how the water supply for the farm and dairy is arranged. In this case a concrete bottom and foundation was built, upon which the walls of the water tank were erected. This tank was built *in situ*, with forms 1 ft. 3 in. by 3 ft., and making the walls 4 in. thick. The mixture used was 1 part cement, 2 parts sand, and 4 parts shingle. The whole work was reinforced with old iron, and one ring was built per day. A top was made with wooden supports to hold the reinforced cement top until dry. The labour was entirely unskilled and, including the raising of sand and carting from a near-by gravel pit, the time taken was 2 men for 12 days. The tank is 8 ft. high, and has an internal diameter of 12 ft., holding approximately 5,700 gallons. The water is pumped in through a hole at the top, and for use is drawn off half-way up through a tap and also through pipes to the horse- and cow-yards and sheds, etc., by gravitation only. There is also a hole at the very base of the tank allowing all the water to be drawn off for cleaning purposes. It is filled by a 3-in. centrifugal pump coupled direct to a De Dion petrol engine which easily fills the tank in 75 minutes, using about three pints of petrol.

The writer wishes to thank Mr. Cecil Whittome, Brundon Hall, Sudbury, Suffolk, for kind permission to publish the photographs illustrating this article.

* * * * *

THE WORKING OF THE SEEDS ACT, 1920.

DURING the season 1922-23 9,000 inspections under the Seeds Act, 1920, have been made by the Ministry's outdoor staff. These inspections have included the premises of the large wholesalers, the retailers' shops, shops where seeds are sold merely as a sideline during a limited period of the year, markets, auction-marts and farms.

With the exception of certain points which will be referred to in detail below the Regulations now appear to be thoroughly well understood by the majority of seedsmen, and are being complied with in a satisfactory manner.

Control Samples from Bulk.—The number of control samples taken from bulks during the season amounted to 583, and included 159 samples of clovers, 105 of grasses, 11 of field seeds, 49 of roots, 241 of vegetables and 18 of cereal seeds.

67 of these samples, mainly clovers and grasses, showed as a result of the official check test, that the declarations made by the sellers were incorrect in some material particular. In 19 cases the germination differed by from 10 to 15 per cent., 6 differed by from 15 to 20 per cent. and 9 were wrong to the extent of over 20 per cent. in the germination figure. In 6 cases the purity was shown to be from 8 to 5 per cent. out, another 6 differed by from 5 to 10 per cent., and there was one case in which the purity was declared as more than 10 per cent. higher than was shown by the check test. The principal sources of error in the remaining cases were, omissions to state the presence of dodder in clover, and incorrect statements as to the presence of injurious weed seeds. In all cases where the check test showed a marked discrepancy from the vendor's particulars, the matter has been taken up with the person concerned.

Packeted Seed.—A notable improvement is shown in connection with the small packet trade. It would appear that the Act is having the effect of gradually driving the greater portion of this class of trade into the hands of a few big firms who understand what is required of them and who are distributing good quality seed. Of the 260 control samples of packeted seed taken during the past season 88·9 per cent. were shown by check tests at the Official Seed Testing Station to be at or above the minimum percentages of germination and purity laid down in the Regulations; 3·8 per cent. were below the minimum but above two-thirds; and the remaining 7·3 per cent. were below

two-thirds of the minimum. Most of the samples falling within the latter group were of packets taken on the premises of small sideline dealers which had been carried over from previous seasons. Appropriate action has been taken by the Ministry in all these cases.

Licensed Private Seed Testing Stations.—Tests for the purposes of the Seeds Act, in the case of seeds other than garden seeds, must be made at one of the official testing stations, or at a station licensed by the Ministry for that purpose. The total number of licences issued to date for this purpose in England and Wales is 84, and includes 29 to test all kinds of seeds covered by the Act, 4 to test all kinds of seeds except grasses and clovers, 1 to test clovers, ryegrass, cereal and field seed, 7 to test field and cereal seeds, 5 to test field seeds and 88 to test cereal seeds. Of these licences 16 have been issued since August, 1922, and include twelve for testing cereal seeds only.

One of the greatest difficulties experienced in administering the Testing of Seeds Order, which was the forerunner of the Seeds Act, arose from the variation in the results of tests carried out by the various analysts. By confining testing for the purposes of the Act to official and licensed stations this difficulty has been reduced to an appreciable extent, but there is still a considerable amount of divergence in results which causes trouble both from an administrative and a commercial point of view. Up to the present a certain amount of freedom has been allowed to these licensed stations with regard to the methods they employ for testing, but it is increasingly evident that a much higher degree of uniformity in methods is necessary in order to obviate discrepancies in results between the various licensed stations and between these stations and the official stations.

In order to check the results of tests carried out at licensed stations the Ministry has taken from these establishments, during the past season, some 670 special samples. The check tests carried out at the Official Station have shown that in 20 per cent. of these samples, discrepancies have occurred—mostly in the percentage of germination—greater than the prescribed limits of variation. In fairness to the licensed stations, however, it should be pointed out that Inspectors are naturally inclined to draw samples of those kinds of seeds, such as oats, trefoil, mangolds and peas, which are known to give varied results, so that so large a percentage of discrepancy as 20 per cent. would not hold for all the tests carried out at these establishments.

At a well attended conference of official and private seed analysts held at the English Official Seed Testing Station on the 10th August, 1923, this question of discrepancy in results and the importance of uniform methods of testing being employed was discussed in great detail and it is hoped that, as a result of this conference, a series of instructions for testing will be laid down which will considerably reduce the variation in results at present obtained.

As a further means of securing uniformity in methods and results it is intended that the Official Seed Testing Station shall from time to time issue to all licensed stations appropriate samples of seeds for comparative testing. The results of all these tests will be collected and examined and recommendations made for changes in methods, consistent with the evidence produced.

Another step towards uniformity is to require that all analysts in charge of licensed stations shall take one of the courses in seed testing which are arranged for at the Official Seed Testing Station each summer.

The variation in results obtained at different stations is not confined to this country alone, but is a difficulty which is met with in all countries where seed testing is carried on. This problem received considerable attention at the Third International Seed Testing Congress held at Copenhagen in 1921, and has since been the principal study of the "Association of Seed Analysts and Seed Control Organisations of Europe" which was formed at that Congress.

It is of interest to note here that the Fourth International Seed Testing Congress is to be held in London and Cambridge in July, 1924. A Committee appointed by the Ministry is making the necessary arrangements, and invitations to send official delegates to the Congress have already been issued to all the principal foreign countries and to the British Dominions and Colonies.

Cereal Seeds.—Opinion remains divided as to the desirability of cereal seeds being included amongst the kinds of seeds covered by the requirements of the Act, and considerable difficulty is met with in the administration of the Act in this connection. It is unfortunate that the circumstances under which a large proportion of the sales of cereal seeds are effected are such that it has been found necessary to authorise a delay of up to a month in the delivery to the purchaser of the statement as to quality.

It seems clear, however, that it is better that the purchaser should receive particulars as to the quality of the seed a week

or so after the seed itself has been delivered than that he should be supplied with no particulars whatever.

The commonest argument against the inclusion of cereal seeds is that anyone with experience in handling seed corn can estimate its capacity for germination by eye with sufficient accuracy for practical purposes. Numerous tests at the Official Seed Testing Station show, however, that cereal samples are extraordinarily deceptive as regards their germinative capacity, many plump good looking samples giving germination results of as low as 40 per cent., while many samples of poor shrivelled and bad coloured grain have given results well above the minimum percentage prescribed by the Regulations.

Seed Potatoes.—Next to cereal seeds, seed potatoes give the most trouble as regards the administration of the Act. To a great extent the reason for this is that seed potatoes are sold during a very short period of the year by a very large number of small traders, and it is consequently extraordinarily difficult to keep in touch with this trade. In practically every case investigated the necessary statement required under the Act, viz., the class, variety, size and dressing, appeared on the invoice supplied by the merchant, but either through ignorance or carelessness the small retailer frequently neglects to display these particulars alongside seed exposed for sale or to deliver a written statement to the purchaser in the case of a sale.

It has been suggested that the Act should not apply to sales of small quantities of seed potatoes of less than 112 lb. It is considered, however, that it is just this class of purchaser, the allotment holder and gardener, who buys his seed in small lots, who requires the protection of the regulations. The big buyer has more experience and is less easily fobbed off with unsuitable seed. A frequent source of trouble is the practice of merchants passing on orders to a grower for direct delivery to the purchaser and not taking sufficient care to ascertain that the particulars as to class, variety, size and dressing are accurate. It is suggested that merchants in their own interests, should take such steps as are necessary to see that the potatoes loaded by the grower correspond with the description given to the purchaser.

Sales by Auction.—Large quantities of seed potatoes are sold by public auction, and difficulty is experienced from time to time in getting the necessary particulars displayed and delivered. As a general rule auctioneers are very helpful in this respect in pointing out to the sellers the requirements of the

Regulations. The auctioneer, however, is acting merely as an agent for the seller and is, therefore, not directly responsible for the necessary declaration. It should be clearly understood that a sale of seed potatoes by public auction is affected by the Seeds Regulations to exactly the same extent as a private sale.

Propaganda.—In addition to the normal practice of distributing a large number of leaflets describing the Act, arranging for lectures at meetings of farmers, etc., efforts are now being made to get into touch with farmers by means of a special seed exhibit at a number of Agricultural Shows. The interest displayed in these exhibits has been very encouraging, and it is believed that this is one of the best methods of bringing home to the farmer the necessity of sowing only tested seed and thereby checking the practice of direct farmer to farmer sales of untested seed, which is so undesirable, but so difficult to prevent.

Distinctive Name of Variety.—The Seeds Regulations (Reg. 3 (1) (c)) require in the case of a sale, or exposure for sale, of Cereals, Red Clover, White Clover, Crimson Clover and Sainfoin, that the distinctive name of the variety of the seeds must be declared, or if the distinctive name of the variety is not known, or the stock is mixed, a statement must be made to that effect.

In practice this Regulation is generally complied with, except in the case of Red Clover, in connection with which much regrettable confusion exists. Red Clover is variously sold as "Red Clover," "Cowgrass," "Single Cut Cowgrass," "Perennial Red," "Giant Hybrid Cowgrass," "Late Flowering Red," "Common Red," "Broad-leaved Red," and "American Mammoth."

There are, however, only two distinctive varieties of Red Clover, one the Early or Broad Red Clover which is favoured for its production of spring and winter growth and for the good aftermath, and the other the Late Flowering Red which is the more persistent variety and therefore most useful for long duration leys or for permanent pastures. As these two groups are so clearly defined and each has its own particular characteristics and value there is no excuse for the present multiplicity of names. Moreover it is of the utmost importance that the farmer should know the type of seed he is buying.

Country of Origin.—It is beginning to be realised that valuable as is the information required to be disclosed in the case of a sale of seeds as regard the purity and germination, these particulars are only preliminaries when the importance of

variety, strain and nationality are considered. The Seeds Act requires the country of origin to be disclosed in the case of a sale of clovers and grasses, but it is probable that too little weight is given to this information. When considering the quality of a lot of seeds the farmer is well advised to look to the country of origin in the first place, and to examine the figures as to germination and purity in the light of this information. When given the choice between a lot of red clover seed grown in America or France or Italy with a high percentage of purity and germination on the one hand and a lot grown in England or Wales with a germination and purity of a lower percentage than its foreign rival on the other, the farmer is well advised to choose the latter as it will almost certainly give him a more satisfactory crop. No tests can specify the constitution of the seed, but all trials indicate that home-grown seed furnishes a higher proportion of plants capable of standing the winter under our conditions of soil and climate.

It is said that one of the results of the Seeds Act is that too much attention is being directed to germination and purity, and that consequently home-grown seed which in many cases cannot compete with foreign seed as regards purity, germination and appearance, is becoming less popular with the farmer and, as naturally follows, with his supplier the seedsman. Too much stress, therefore, cannot be laid on the distinct advantages of using home-grown seed even though it may show a lower percentage of germination and purity.

In this connection it is of interest to draw attention to the two Associations recently formed in Wales, the "Vale of Clwyd Red Clover Growers' Association," and the "Montgomeryshire Welsh Clover Growers' Association," particulars of which were given in this *Journal* for September, 1923. The main object of these Associations is to foster the growth of the two special strains of red clover grown in these districts, to provide for the certification of the true strains and the testing of the seeds under the Seeds Act.

Prosecutions.—Legal proceedings for infringements of the Seeds Act have been taken in 9 cases during the season 1922-23. A summary of these cases is given below.

In June a Portsmouth firm of seedsmen were prosecuted for selling packets of vegetable seed bearing labels which indicated that the seeds were up to the authorised minimum standard of germination prescribed by the Seeds Regulations, but which, on being tested, were found to be much below the prescribed figure. Four separate summonses were issued, one in respect of each of the samples taken, and a fine of £1 was inflicted in each case with a total of two guineas costs.

A local tradesman, who deals in seeds as a side-line, was brought up at Beaumaris Petty Sessions on 30th June on charges of (1) failing to deliver to

an Inspector who took a sample of seeds a copy of the particulars declared with regard to purity and germination; and (2) exposing the seed for sale without a statement of these particulars being displayed on or near the seed. The first summons was dismissed on payment of costs, but a fine of 10s. 6d. was imposed on the second charge, and an advocate's fee of a guinea was allowed.

A similar case against an Anglesey shopkeeper was heard at Valley Petty Sessions on 9th July, the charges being identical with those in the case previously mentioned, the defendant was fined the sum of 5s. in respect of each charge.

On 16th July, a case was heard at Llangefni when the defendant, a local draper and seed merchant, was convicted of failing to deliver to the Inspector who took the sample a copy of the particulars with regard to the purity and germination of a parcel of yearling seed which had not been re-tested. A fine of 10s. was imposed in this case.

At Dolgelly a summons against a firm of general storekeepers was heard on 24th July, the charge being the same as that in the preceding case. The defendant pleaded ignorance, but the prosecution was able to show that attention had been particularly called to the requirements of the Act a year previously, and a conviction was obtained, the defendant being fined £2 10s. and a guinea costs.

A prosecution for failure to deliver a statement showing the prescribed particulars in the case of a sale of seed potatoes was heard at Stratford-on-Avon on 1st August. The sale was a cash transaction, and the defendant took the line that the potatoes were not sold as seed. It was possible, however, to convince the Bench that they were, in fact, sold for planting, and a fine of 10s. was imposed.

On 25th August at Colwyn Bay Police Court a charge of making a false statement in connection with the sale of packets of seed was heard. The seed in question was parsnip which was guaranteed to germinate to not less than the minimum percentage mentioned in the Seeds Regulations. On being tested at the Official Station, however, it was ascertained that the seed was dead. A fine of £1 was inflicted in this case and an advocate's fee of a guinea was allowed.

Two charges were heard at Bangor on 4th September against a Llanfairfechan tradesman in respect of (1) failure to display the prescribed particulars in respect of seed exposed for sale, and (2) making a false statement with regard to the germination of seed. On the first charge, which was based on a Control Sample taken by an Inspector, the defendant was fined £1, and 1½ guineas advocate's fee was allowed. In the second case, however, the packet of seed in question had been purchased on behalf of the Inspector by a private individual, and the defendant was able to claim that some doubt existed as to whether the seed tested was, in fact, that purchased from him. The summons was, accordingly, dismissed on payment of costs.

A charge of making false statements in connection with the sale of three consignments of seed potatoes was heard at Chatteris on 4th September, the defendants being a well-known local firm of seedmen. Samples of the three consignments had been taken by an Inspector from a shop in Oundle in March and grown on at Ormakirk, the results showing that the variety had been wrongly described in each case. A fine of £3 was inflicted.

A firm of seedsmen were prosecuted at Taunton on 5th September, the charges being (1) making a false statement respecting a sample of trefoil seed, and (2) failing to deliver to the Inspector who took a sample of red clover seed the prescribed statement. In the first case it was admitted by the defendant that a certain amount of yearling seed had been added to the sack from which purchasers were supplied, and that the particulars he was declaring were those supplied to him in respect of the new seed. A fine of 10s. was imposed in this instance. On the second charge the defendant pleaded that he had omitted by an oversight to have the seed re-tested, and as the seed was found to be of good quality the Bench dismissed the summons on payment of two guineas costs.

Amendments of Seeds Regulations.—No amendments have been made in the "Seeds Regulations, 1922," so that, unless some unforeseen circumstances should arise, the Regulations will be the same during the season 1923-24 as those which were in operation last season.

Copies of the Seeds Act, 1920, and of the Seeds Regulations, 1922, may be obtained through any bookseller, or direct from H.M. Stationery Office, Imperial House, Kingsway, W.C., price 3d. each.

THE CONTROL OF APHIDES ATTACKING SPROUTING POTATOES.

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In a recent paper* F. V. Theobald describes the species of aphides (green flies or plant lice) attacking potatoes in this country, three of which have occurred on sprouting tubers, and it is stated that such attacks are frequently severe. The species concerned are *Macrosiphum solanifolii*, Ashmead; *Myzus persicae*, Sulzer, and *M. pseudosolani*, Theobald. In January, 1921, the writer investigated a severe attack on boxed sets at Holyhead, and has since found that similar cases are by no means rare. The species in all these North Wales cases has been *M. persicae* (of a form named by Theobald *tuberoscella*, but now regarded by him as merely a variety of *persicae*). This common species occurs on a considerable number of host plants, both out of doors and under glass, as well as on the potato, and is one of the species accused of transmitting diseases of the virus group. It was taken on field potatoes in small numbers in 1922, and has been fairly common this season (1923), especially

* "The Aphides attacking the Potato," F. V. Theobald, S.E. Agric. College, Wye, 1922.

in some sheltered gardens. The strain of aphides obtained at Holyhead has been maintained in the laboratory at Bangor on sprouting potatoes, and a number of observations have been made as to its habits, etc., while some experiments have been conducted with the object of determining a method of control at once easy of application and harmless to the sprouting tubers.

Breeding Experiments.—*M. persica* breeds very rapidly on boxed potatoes throughout the winter under sheltered conditions, and not only causes shrivelling of the sprouts, but coats the tuber with sticky "honeydew" to which adhere the cast skins of the insects. On 23rd January, 1921, at Holyhead, well-sprouted tubers of Sharp's Express, Ally and Majestic were smothered with all stages of the pests, while winged females were abundant. Many varieties have been tried, and all appear equally liable to attack. On 7th November, 1922, a few viviparous females were transferred from shrivelled tubers to the young haulm of potatoes grown in pots, and by 4th December dense colonies had formed, and the young shoots were withered and nearly dead, while winged forms were produced by 6th December. On the 11th December single apterous females were moved to sprouts of several varieties of tubers, and colonies were forming on the 25th, while by 10th January, 1923, the infestation could be described as "heavy" and a few winged forms were to be seen. These winged aphides fly to the nearest window, where they congregate in hundreds, but if placed on fresh potato sprouts they will frequently settle down and produce colonies.

During the period mentioned above the temperature of the laboratory varied considerably, going as low as 46.5 deg. F., and as high as 61.5 deg. F. Another series on Dargill Pearl was tried in an unheated room. Ten tubers were colonised with a single female each on 10th January, 1923, and on 18th January showed increases ranging from 7 to 15 larvæ (with an average of 10). Other females placed on Sharp's Express on 11th January, each produced from 3 to 8 young by the 18th January.

Removal of aphides from sprouts to foliage succeeded in the laboratory, but not under garden conditions in May, 1922, under unusually fine warm weather conditions, and only to a slight extent in May, 1923; but plants infected on 25th May showed numerous larvæ by 16th June.

In January, 1923, several hundred sprouted tubers were obtained from the College Farm, and colonised with *M. persica*,

and these were used for a series of experiments on the control of the aphides.

In 1922 and 1923 series of heavily infested tubers were planted at various stages of attack. If the attack has not been of too long duration, good plants result; but if the sprouts become shrivelled, only weak plants are produced, while in some instances death follows planting. Planting kills the aphides; in only one instance (May, 1923) was a single aphid found on a plant grown from an infested tuber, although forty such were examined.

Control Experiments.—For control, fumigations with a preparation containing tetrachlorethane were tried; also paradichlorobenzene (crystal and fluid), and a nicotine sulphate dust containing 5 per cent. of nicotine sulphate (40 per cent. black leaf) equivalent to 2 per cent. of pure nicotine.* The tubers were examined after treatment and again 48 hours later, and were finally planted in a garden in the ordinary way in order to observe any effects of treatment on subsequent growth. Preliminary tests were made with a few tubers planted in pots.

All the substances used killed the aphides, but in the case of paradichlorobenzene several hours' exposure to the fumes was required to kill all the insects, owing to the temperature being too low to allow of the gas being fully effective.† The tetrachlorethane preparation killed rapidly at ordinary laboratory temperatures (between 50 and 60 deg. F.), the exposure being reduced to one hour and being quite effective then.

The nicotine sulphate dust was applied by means of hand bellows, two or three puffs sufficing for a box of tubers. The aphides were affected almost at once, and few survived half an hour after treatment.

The following series were planted. 106 tubers in all:—

- I. 16 tubers of Sharp's Express heavily infested with *M. persicae*, and exposed to the fumes of paradichlorobenzene for 4 hours at 54-56 deg. F., 4th April, 1923.
- II. 30 tubers of Sharp's Express, heavily infested, and exposed to fumes of tetrachlorethane for one hour at 52-56 deg. F., 3rd April, 1923.
- III. 30 tubers Sharp's Express, heavily infested and dusted with nicotine sulphate at 52-56 deg. F., 26th March, 1923.
- IV. 30 tubers Sharp's Express, heavily infested, planted without treatment.

On 24th May all these were carefully examined and all were up.

* The writer is indebted to Messrs. Murphy & Son, Ltd., for kindly supplying this dust.

† "Paradichlorobenzene as an Insect Fumigant," A. B. Duckett, U.S. Dep. Agric., Bull. 167, 1915, p. 2.

The first and second lots were markedly backward and weak, as compared with the rest; some being barely above the surface, and none more than 5 in. in height.

Lot III, treated with nicotine sulphate dust, and the untreated lot, were for the most part strong and vigorous, with here and there a backward one (due to the weakening effects of aphid attack), and were from 4 to 8 in. in height. The crop was raised and weighed on 26th July, with the following results:—

- I. 10 plants from tubers fumigated with paradichlorobenzene yielded a total of 2 lb. 9 oz., a marked feature being the large number of very small tubers.
- II. 10 plants from tubers fumigated with tetrachlorethane yielded 4 lb. 4 oz.
- III. 10 plants from tubers dusted with nicotine sulphate yielded 8 lb. 6 oz.
- IV. 10 plants from tubers not treated prior to planting yielded 8 lb. 6 oz.

The relatively low yield must be attributed to the results of aphid attack; while the effects of fumigation with paradichlorobenzene and tetrachlorethane may possibly have been intensified by the previous severe injury by the aphides. It may be mentioned that Speyer* has noted that fumigation experiments with tetrachlorethane showed remarkable variations as regards the susceptibility of certain plants to injury by it. Further investigation is required in this connection. It should be noted that the tetrachlorethane used was not pure, but a proprietary preparation.

It might appear, from a casual examination of the results, that, although nicotine sulphate effectively killed the aphides, there is no advantage in the treatment, as the crop from the treated tubers was no better than that from untreated seed. This is hardly a fair conclusion. Both treated and untreated seed had, before planting, been seriously weakened by the aphid attack, and had the nicotine sulphate been applied when the attack commenced, say in January (instead of April), the results might have been very different.

When the presence of aphides is noted on sprouting potatoes, treatment should be undertaken at once; as the earlier this can be applied the better, before the aphides have had time to weaken the sprouts. Potatoes intended for seed should therefore be examined from time to time, as the attack may easily escape notice, especially in the early stages. Later the pale cast skins of the insects adhere to the sprouts, drawing attention to their

* Speyer, E. R. Rept. of Entomologist, 8th Ann. Rept., 1922, Expt. & Res. Sta., Chesbunt. (Rev. Appl. Entomol., XI. A., p. 47, July, 1923.)

presence, and still later marked shrivelling is seen. Treatment by means of the 5 per cent. nicotine sulphate will prove most effective on potatoes sprouted in boxes, etc., in single layers (as in the case of the experiments here described). The tubers are thus freely exposed to the fine dust, and a considerable quantity can be dealt with rapidly and effectively by means of hand bellows, sulphurator, etc.

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"SCORCH" OR GLOEOSPORIUM DISEASE OF RED CLOVER.

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Owing to the autumn and winter of 1922 in the South-East of England having been damp and unusually mild, severe outbreaks of the disease known as stem rot or clover sickness, caused by the fungus *Sclerotinia trifoliorum*, became widespread through numerous crops of red clover. As a result of this attack, many fields of red clover by the spring of 1923 were reduced to such a patchy condition that it was an open question as to whether they should come under the plough; frosts and dry weather, however, prevented further damage by the fungus and the majority of thin "plants" produced, by the middle of May, a promising growth.

By this time, however, a further trouble had arisen and complaints were received, up to the time of cutting in mid-June, that the crop was suffering from a disease of a very different nature which resulted in blackening and breaking of the stems and withering of the leaves (Fig. 1).

Such damage resulted that in the majority of cases fresh stems from the crown, which should normally provide the second cut, had grown up prematurely to replace the brown stems and brittle leaves of the first cut, and the two were mown together in June.

The growth of fresh green stems and leaves at the time of cutting gave the impression that the crop had partly recovered, but it is important to realise that substitution of diseased stems by fresh growth played an important part in the apparent recovery, and though the bulk for hay had improved, the individual plants themselves were no more healthy and the second cut suffered accordingly. It has been found in other cases that the second cut may be attacked more heavily than the first.

Examination of affected plants showed the presence of a fungus agreeing closely with *Gloeosporium caulivorum*, Kirch.

The disease, also called "Anthracnose," has been investigated in this country by Miss Sampson and other workers* and has been described on the Continent and in America where it is apparently more harmful. It was mentioned by the Ministry† as occurring in 1920, and was described as "a usually scarce disease." It was first recorded by Mr. F. R. Petherbridge near Cambridge in 1920, and one crop in that year was known to have been ploughed up after the first cut had been taken. In certain districts in Kent the effects had become so prominent in the early summer of 1928, and the cause remained so inconspicuous, that as a result inquiries were made by farmers. It seems therefore desirable that the present disease should be described in order that the symptoms may be generally recognised.

Appearance in the Field.—Throughout the field and particularly in patches, it is noticeable that the upright stems and leaf stalks of the clover are marked with narrow, dry depressions, varying in length from $\frac{1}{2}$ in. to 3 in. or more, having black margins and lighter coloured centres.

The depressions are either quite shallow, or more frequently a portion of the stem on one side is destroyed and the lesion consequently forms an oblong pit which penetrates to the pith or hollow centre of the stalk; the sides, when dry, tend to roll inwards and so cause the lesion to open slightly. The cavities thus made in the side of the stem might, from their appearance, well be caused by slugs, which are usually plentiful in clover leys, and in some cases the damage was actually attributed to them.

Around the margins of the lesions, and within the cavities, small white pustules of the fungus *Gloeosporium* can be seen with a lens (Fig. 2), but these are at all times very inconspicuous, and are most evident under moist conditions. The fungus, by penetrating the tissues, causes the lesion to increase; a part of the stem is thus destroyed on one side or it may be completely girdled by a more shallow depression and the stalk consequently falls over, causing the death of all leaves and shoots above that point. Similarly the leaf-stalk alone may be attacked and the leaf dies.

* Sampson, K. "Red Clover: Investigations on Anthracnose due to *Gloeosporium caulivorum*," in *Preliminary Investigations with Herbage Plants*, Series H. No. 1, p. 83, Aberystwyth, 1922. Stapledon, R. G. "Plant Breeding Work at Aberystwyth," *Journal of the Ministry of Agriculture*, XXVII. 7. p. 630, Oct. 1920.

† Ministry of Agriculture. "Report on the Occurrence of Fungus, Bacterial and allied diseases on Crops in England and Wales for the year 1920-1921," p. 44.



FIG. 1. *Left*: Red Clover plant free from *Gloeosporium* disease. Total length, 38 in.

Right: Red Clover plant attacked by *Gloeosporium caulicorum*. Total length, 24 in. Fresh green stems and leaves, arising from the crown, can be distinguished in the centre of the plant. These serve to replace the broken stems and withered leaves which are characteristic of the disease.

(Photographed 22nd June, 1923, at the time of cutting.)

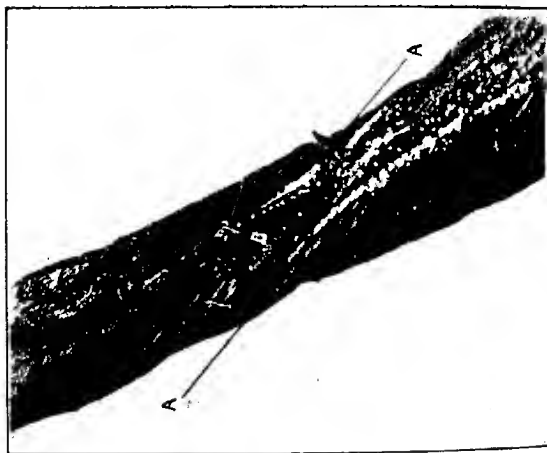


FIG. 2.—Part of a stem of Red Clover showing white pustules of *Glaucosporium crotolariae* in lesions at A, A. ($\times 10$.)



FIG. 3.—Stalks of the three leaflets of a leaf of Red Clover. Two are attacked by the fungus *Glaucosporium crotolariae*, and the third is free from disease. ($\times 10$.)

Occasionally the three short stalks of the leaflets of one leaf are infected, with the same result (Fig. 3). The white pustules of the fungus which appear on the lesions, produce masses of minute spores* which may be carried by insects, wind or rain, to cause fresh infection in other parts. It is possible that infection of the leaflet stalks, as shown in Fig. 3, may be materially assisted by moisture. Water from the leaflet blades, possibly carrying with it spores of the fungus, often being held on these stalks in the form of a drop.

Stems and leaves which are killed become so withered, dry and brittle that much leaf is lost, and, as a result, the hay is of poor quality. The clover field, as a whole, appears as though scorched. As described above, fresh growth from the crown may replace some of the loss, and in the instances observed in June, 1923, this second growth was little attacked. As illustrating the severity of the original outbreak, in one case a farmer described his first cut as consisting largely of the second.

Resistance to the Disease.—It has been noticed this year, in six small trial plots of red clover grown side by side at Wye, that English broad red was strongly attacked, but Chilian and English so-called cowgrass and English late-flowering red to a less extent. "Perennialised broad red" was only slightly attacked and on the Danish strain "Hersnap" the lesions were comparatively rare and no broken stems were found. The difference in intensity of attack was most noticeable, particularly because the Hersnap plot was adjoining the English broad red, and though the tall stems of both became intermingled, the Danish strain remained remarkably free from disease.

When examining diseased crops on the farm, it was noticed that individual plants occurred which were free from disease, though these were growing in the midst of others strongly attacked. The plants shown in Fig. 1 were growing side by side in a clover ley; that on the left was entirely free from *Gloeosporium* disease.† The above facts appear to indicate that there is definite variation in susceptibility shown by red clovers, and that varying intensity of attack is not due merely to differences in external conditions.

The first occurrence of the disease, however, may be affected

* The spores were colourless, curved and unicellular, measuring $10-30\mu \times 4-5\mu$.

† Another disease, Leaf Spot, caused by *Pseudopeziza trifolii*, was present in abundance on this plant. The characteristic marks on the leaves can be observed in the photograph.

by external conditions, since it is considered possible that spores of the fungus may adhere to the clover seed.*

Similar variation in susceptibility to *Gloeosporium* shown by red clovers has been described by Miss Sampson,† the late-flowering reds being found relatively free from disease.

Since it is impossible to counteract the fungus when in a grown crop of red clover, it seems that the most promising method of dealing with this troublesome disease consists in selecting resistant strains in so far as the requirements of the farm will permit, but it must be remembered that weather conditions probably determine the presence or absence of this disease in any particular season.

* * * * *

STOCKBRIDGE SHEEP FAIR.

A. RUSSELL-SMITH.

STOCKBRIDGE Sheep Fair, as the Hampshire saying goes, is always the best, or the worst, of the fairs in the year. It comes first after the lambing season, and the prices ruling reflect the forecasts of the market conditions of the coming year that have been formed by both the flock masters and the buyers. At subsequent fairs those forecasts have been tested and modified in the light of actual prices, but the first fair of the year is likely to be, out and out, either a seller's or a buyer's market.

The fair owes its origin to a grant made by Henry III in 1221 to William de Briwere, the then Lord of the Borough of Stockbridge and of the manor of Whit Somborne. It was to be held on the Feast of the Apostles Peter and Paul, and on the Vigil and morrow of that Feast. The Vigil of the Feast now falls on the 28th June, but before the Calendar was altered in 1752 it fell on what is now the 10th July. As the lambs could not be ready by the altered date Stockbridge has always kept to the old style and opens its fair on the 10th July.

In 1361 the Borough and Manor passed into the hands of John of Gaunt, who had married a descendant of the Briwere family, and from then until 1824 they were held by the Duchy of Lancaster. So far as the records show the fair has been held yearly since its original grant, and it has played an important part in the sheep breeding industry. It has brought

* Fulton, H. R. *Pennsylvania Station Report*, p. 249. 1912. Hegyi, Dezso, in *Mészőgazdasági Szemle*, year XXXIII, No. 2. pp. 55-58. Budapest, 1915. Abstract in *Monthly Bulletin of Agric. Intell. and Plant Diseases*. Year VI, No. 4. 1915.

† Sampson, K. *loc. cit.*

the flock masters in the Down country, of which Stockbridge is the natural centre, into direct contact with the actual buyers of Down sheep from all over the country; and it has done this by offering a large selection in both numbers and quality. Of recent years there has been a falling off in numbers, in part attributable to the growth of frequent auction sales, but in the main to the disastrous reduction in the sheep population on the Downs which resulted from over-selling during the War.

The first influence is a continuing one. Frequent small sales at local centres have their conveniences, but there are men of great experience amongst the flock masters who regard them as fatal to the best interests of the breeders, and of but doubtful benefit to the ultimate buyers. Such sales do not offer a sufficient selection in either numbers or quality to make it worth the while of the big buyers to attend, and, therefore, the sheep are generally picked up by the smaller men to sell again at a profit. The result is that at the auction sales the middleman too often makes the prices, and the breeder and the ultimate buyer have to bear between them, as best they may, the middleman's profits.

The second influence that has reacted to the prejudice of the fair, is happily passing. The sheep population of the Downs is increasing as the truth is being driven home that in the Down country it is impossible to grow wheat without sheep. No artificial fertilisers can ever do the work that is done so thoroughly by the "golden hoof." It must take time to re-establish the flocks that were so seriously reduced during the War, but a start has been made.

It was in these circumstances that a meeting of flock masters and others interested in Hampshire Down sheep, held in Stockbridge in February, 1928, resolved:—

1. That it is in the interest of the neighbourhood that the early sales of sheep and lambs should be concentrated at the Stockbridge Sheep Fair.
2. That to maintain quality, it is desirable that prizes be offered at such fair.

The meeting appointed a Committee of representative local farmers to make these resolutions effective.

As the result of the efforts of this Committee, the fair held on the 10th July last showed a marked improvement on those of recent years. Upwards of 2,600 sheep and lambs were penned, or more than double the number offered in 1921 and 1922, but still far below those of pre-War times. There was keen competition for the prizes, which, to the value of £47,

were given by well-known flock masters and others in the neighbourhood for the best pens of pure-bred regular draft ewes, two-tooth ewes, wether lambs, cross-bred wether lambs, pure-bred ewe lambs and cross-bred ewe lambs, and a special prize for the largest penner. In each class there were prizes for the shepherds as well as the breeders. It was possible for any breeder to compete in the classes mentioned, provided he penned his exhibit in the proportion of 20 to every 100 ewes in his flock, nor was it incumbent on him to dispose of his two-tooth ewes or ewe lambs, which he might send, as several did, for competition only. In other respects the ancient character of the fair was maintained, and it was open to all who had sheep to dispose of. One interesting feature worth recording was the encouragement given by the present Lord of the Manor in formally declaring the fair open, accompanied by his bailiff bearing the historic silver mace of the town of Stockbridge.

Flock masters feel that a good start has been made towards re-establishing the usefulness of the fair, and are confident that if the buyers of Hampshire Downs will have a little patience, and in the meantime continue their support, Stockbridge will be able in the near future to offer again a full supply of sheep of the best quality. If this can be done then the fair will fulfil the purpose it has served since it was created 702 years ago: it will enable the breeders in the district, as a whole, to get into direct contact with the buyers on the market wherever they may be, it will broaden out the chances of business by offering a bigger selection than can be found at the local sales, and it will help in avoiding the cost of the middleman.

* * * * *

CO-OPERATIVE MARKETING BY SMALL PRODUCERS.

THE advantages of co-operation are now so well understood that it is unnecessary to dwell on them here. Even the largest and most powerful interests find it desirable still further to strengthen their position by combination, and if the small producer is to achieve any useful result it is clear that it can be done only by working in conjunction with and not in opposition to his or her neighbours. The advantages of co-operative working, therefore, are taken for granted. The question is how best to apply the principle to the problem of the

sale of produce. The following notes were originally drawn up for the guidance of Women's Institutes by the National Federation of Women's Institutes, but the principles are equally applicable to any small society undertaking marketing.

The kinds of produce to be considered will usually be fruit, potatoes, vegetables, eggs, poultry and rabbits, with butter and possibly cream and small cheese in some counties. In many parts of England there are now in existence substantial agricultural co-operative societies which provide the farmers with their feeding stuffs, fertilisers, seeds, and other requirements. Though the sale of farm produce is now receiving more attention, much less has been done on that side by the large societies, and it is suggested that small societies could usefully strike out a line for themselves, namely, in endeavouring to supply the smaller towns. Covent Garden and the great industrial towns are and must be catered for by the large grower. Mass consumption demands mass production and it will not pay to place on rail for transport over long distances small mixed lots which will have to compete with the large consignments of high-grade well-packed produce sent forward by the larger growers.

The Opportunity of the Small Producer.—Many small country places are much worse provided for than the great towns, and it is a striking fact that much of the produce which is seen in the shops in the smaller towns has been obtained from Covent Garden. Here, then, would seem to be at least one opening for the small producer.

The collection of the produce, its conveyance to the point of consumption and the method of selling will all require to be carefully thought out. Conditions vary so widely in different localities that it is hardly possible to do more than throw out some general suggestions and hints, leaving to a committee on the spot to work out details.

Studying the Market.—The first thing to be done is to decide which market is to be supplied, then to study what it needs. There is in this country—and it applies to large producers as well as to small—too great a disposition to grow *something* and to hope that when it is ready it will be wanted. A better plan is to consider what will probably be required by the public and the season's demand and to grow that, and particularly to grow what is likely to be in short supply.

Next, sellers must be taught the necessity of packing attractively, and as far as possible in accordance with best trade

custom. Senders should be taught to visualise their produce after it has reached the point of sale, and to consider what its condition will be by then.

A difficulty will be the number of different varieties of certain things. In the case of co-operative marketing societies receiving produce from many individuals this difficulty is bound to remain, though even here some improvement can probably be effected. If the society can supply seeds and seed potatoes, which may be obtained from the nearest farmers' co-operative supply society, it can then specialise on a few only of the best varieties, and each member can be encouraged to grow as few sorts of each crop as possible.

Collection and Delivery.—It can be arranged either for members to bring in their produce to one centre or for the marketing society to collect it. In the first case neighbours can co-operate. In the second a sufficient charge for collection must be made to cover the cost. In one Women's Institute, at Watton, Herts, the plan is for the members to bring their produce to a centre in the village, where it is all picked up by a motor lorry and conveyed for sale to the market town (Hertford), five miles distant, a charge being made to cover this service.

Methods of Sale.—Two methods are open to marketing societies. They may either :—(a) Act as agent or salesman, charging a commission on the produce sold to cover expenses, or (b) arrange for the marketing committee to buy the produce itself for resale at a profit.

The second method involves considerable risk. In the first place if the marketing committee are not both experienced buyers and judges of demand they may be left with the goods on their hands. Secondly, to be successful they must maintain the right of rejecting unsuitable produce, and the exercise of this right may offend the members who wish to dispose of their surplus produce, and so kill the marketing scheme at the outset.

It should be realised that, where any business is entered into which involves liabilities on a considerable scale, a *registered society should be formed to deal with it*. An institute or club as such should not undertake it.

A stall may be rented in the market for the disposal of the goods, or more permanent premises may be taken, but care should be exercised that the cost is not too great for the amount of trade expected. Occasionally it is possible to make

an agreement with the auctioneer in the market by which all the produce is sold under the hammer.

Ways and Means.—*Committee.*—This can be either the executive committee of the club or institute, or a special marketing sub-committee. A fairly small committee is desirable for this purpose.

Workers and Wages.—It will probably not be possible to pay much in wages. Possibly in a good many cases there will be one or more members who will make this their contribution to the institute or club, and will undertake to help voluntarily. In other cases, without paying a definite salary, it may be possible to give a small honorarium to the person who bears the brunt of the work.

Capital.—Whether capital to any considerable amount is required must depend entirely on the nature of the business it is proposed to undertake. If it is run on very simple lines comparatively little may be needed, though it may even then be necessary to buy a stand and trestles for a stall, egg boxes, baskets, etc., and to arrange for transport. If this is done, a special fund for the purpose should be raised.

Where business on a large scale is contemplated it will probably be best to register a separate co-operative society and proceed to issue shares (see below).

Expenses.—The institute or club will of course aim at returning to members the best price possible for their produce. Zeal for economy must not be carried beyond the limit of sound business, and sufficient margin must be allowed to cover rather more than full working expenses. What the margin should be must depend on local circumstances, but the committee should be most careful to ascertain what are the weekly working expenses and what is the weekly turnover. They can then calculate how much must be deducted from the payments to the members so as to make ends meet and leave something over to place to a reserve fund at the end of the year.

In the case of 12 Women's Institutes with marketing schemes, three charge 2d. in the shilling to cover expenses; seven charge 1d. in the shilling; one charges 2d. on perishable goods and 1d. on non-perishable; and one charges 1d. to members and 2d. to non-members.

It is better to start with sufficient margin and then be able to reduce than to make losses at the start and perhaps wreck the scheme. Eggs can probably be handled more cheaply than more bulky produce.

Registration.—The question arises whether voluntary societies which develop into trading bodies should seek registration with limited liability under the Industrial and Provident Societies Act. Registration entails both advantages and obligations. On the one hand the liability of individuals is limited to their shareholding and rests on all the shareholders instead of resting personally with the officials and committee. On the other hand registration involves the issue of shares and the obligation and expense of a public audit.

On the whole it would seem that where marketing is undertaken on a small scale or in a simple form such as that explained under the heading *Methods of Sale (a)* above, registration may be deferred, but that if the business becomes large or where considerable amounts of capital and other responsibilities are involved, the registration of a separate trading society will be desirable. In the latter case the Agricultural Organisation Society will supply rules and assist with the formalities.

Accounts.—A simple system of accounts will probably suffice, but it is most important that the accounts be kept accurately and up to date. If possible the advice of a professional accountant should be sought as to the best system. A separate bank account should be opened for the produce department and all money be paid into it.

Insurance.—Buildings, stock, motor vehicles, etc., should be insured against fire and accidents. Employer's liability risk should also be covered.

Eggs.—In many country districts special interest is attached to egg production. It was suggested above that in the first place effort should be concentrated on supplying the immediate locality rather than sending produce away by rail. Eggs to some extent are an exception. They can more readily and profitably be sent away than most other produce. Even with eggs, however, there is a further consideration. For the greater part of the year new-laid eggs find a ready sale and the eggs on a market stall will often help to sell vegetables and other produce which may be less in demand. It will be advisable, therefore, to send away only surplus eggs which cannot be sold locally.

Regularity of Supply.—Irregularity of supplies is the rock on which have foundered many promising schemes for the sale of produce. The quantities of apples, eggs, cheese, etc., which come to us from overseas are shipped to a large extent

by co-operative societies, but in their case it is becoming more and more the custom to hind the grower under an agreement to sell the whole of his produce through his society.

Care must of course be taken that the needs of the village are supplied first, but suppose for argument an institute or club starts a market stall in a country town. People come there to buy and will expect to find regularly what they need. It is no use providing an excess of cabbages one week and none the next, but sending instead an over supply of poultry. In that way very poor prices will be the first result, and complete failure the second. Another serious offence on the part of some producers is to sell their good quality produce themselves and send in the second-rate stuff to the society. That again will soon break up any scheme. The loyal and *continuous* support of the members is essential.

Before starting, therefore, the committee will be well advised to ask themselves these questions:—Is the right kind of produce available? Is it available in sufficient quantities? Is there reasonable certainty that regularity and continuity of supply can be maintained after the market has been started? If the reply to any of these questions is in the negative, the scheme had better be deferred until the position is more satisfactory.

A Women's Institute Marketing Society: Criccieth, Carnarvon.—As an example some notes are given below of the start and progress of a marketing society formed by the women's institute at Criccieth.

Initial Steps.—This scheme was started in June, 1916, under the direction of the Executive Committee of the Women's Institute. An initial capital of £5 was raised from among the members and, with an additional £5 voted from the general funds of the Institute and the commission on sales, proved sufficient. A market manageress was appointed at 5s. a day, but all other labour, including transport of produce from the depôt to the station, was voluntary. Duplicate receipt books were used and the Committee were responsible for checking the accounts.

The turnover during the first 14 weeks was £245, and the success of the initial venture decided the Committee to turn the Voluntary Co-operative Marketing Scheme into a registered Co-operative Society.

Further Development.—In January, 1917, a Co-operative Society was formed, affiliated to the Agricultural Organisation Society, which gave advice on general organisation. The

society was registered under the Industrial and Provident Societies Act and was open to non-members and men. A large section of women's institute members joined the new society; and shares were issued, assessed on an acreage basis—holders of less than half an acre being allowed to take up one share at 2s. 6d., holders of up to 10 acres might take two shares; those with over 25 acres must have eight shares.

A piece of land was now leased from the Cambrian Railway Company and a wooden building erected to serve as a wholesale dépôt. A small shop in the town was rented on a six months' tenancy to serve as the retail dépôt.

The present staff consists of a part-time Secretary at £35 per annum, a Collector at £2 per week, Sales Manageress at £120 per annum, Assistant 10s. per week.

A commission of 10 per cent. is charged by the society to wholesale firms and an additional 2½ per cent. is charged when selling retail to the public. Prices are fixed on the basis of local and Liverpool markets. Accounts are checked daily by the Secretary during the busy season and are presented to the Committee once a month. A public audit is made twice a year. Produce is obtained by the society from shareholders only, and includes potatoes, poultry, rabbits, eggs, fruit, vegetables, butter, and similar produce. The venture has done much to stimulate production with regard to poultry and eggs

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MAT MAKING.

*Communicated by the Rural Industries Intelligence Bureau,
258, Westminster Bridge Road, London, S.E.1, where
reprints can be obtained.*

THE making of woollen rugs by hand on canvas is often advocated as a paying home occupation for elderly persons, invalids, disabled soldiers and others, but it is very seldom that it is found to be so in fact. The chief reasons for the popularity of the idea seem to be that very little and inexpensive equipment is needed, and that the work is easily learnt, and this is true enough; but other equally important points which are often lost sight of are that the expensive materials required and the amount of hand labour involved make these articles much too costly to be at all readily saleable at rates which will pay the maker. Consequently rug making is really more to be recommended as a hobby than as a means of livelihood. (For remarks on rug weaving see p 852.)

When we turn, however, to a consideration of the possibilities of mat making better prospects are at once disclosed. In the first place, much cheaper materials are used, and in the second, the employment of equipment of a comparatively simple and cheap kind enables the rate of working to be greatly increased, so much so that the selling prices of the product can be quite low consistently with a reasonable remuneration to the worker.

Even so, however, mat making of the kind to be described cannot invariably be recommended as a whole-time industry, mainly because the disposal of output depends largely upon retail sales and a comparatively narrow local connection. Large quantities of mats are imported from India and elsewhere for disposal to traders at prices with which the individual would find it difficult to compete. They are made in standard sizes and patterns by cheap native labour. On the other hand, the local worker's principal opportunity for getting orders from the trade will be due to the special demand, by motorists, car dealers, agents, etc., for small quantities of odd sizes and special shapes, which are very much more expensive when obtained through the usual wholesale channels, but can be produced by the small local maker with little or no greater trouble and expense than the standard sizes—and sold at better prices.

At the same time the supply at any rate of small quantities at wholesale rates to retailers in the worker's neighbourhood or nearest town, need by no means be ruled out as an impossibility, and it should be worth while canvassing them for orders as well as trying for retail sales to private houses, shop-keepers, private or public institutions, etc.

There are few articles of more extensive every-day usefulness than the common coir or fibre mat, and the possibilities of local absorption should easily be sufficient to provide an individual with at least a remunerative part-time occupation. For this reason it might be very suitable for the agricultural worker during his slack seasons. In some cases, where it seems likely that the output of a whole-time worker can be disposed of without difficulty or where special contracts can be obtained, an industry of this sort would be alone able to provide a livelihood.

The work is coarse and fairly heavy, and generally rather unsuited for invalids or disabled men, though some operations undoubtedly could be performed by them. It would depend rather on the nature of the disability. The wool and wool bordered mats entail the least physical exertion, and could be made on the loom by women or girls.

Types of Mats.—There are several different types of mats which can be made, needing varying kinds of outfit to produce. These will be briefly dealt with in order, with an example and estimate of costs in each case.

The following table should be useful—it gives the dimensions of standard mats according to the numbered sizes. The prices wholesale and retail (as at August, 1923) must be regarded as approximate only. They may vary a good deal, not only in different districts, but also, of course, according to quality and price of the materials used; and the wholesale rates would be subject to discount for cash or monthly accounts.

Standard.		Reversible.		Sinet.		Good Quality Yarn.		Wool-bordered.	
No.	Size.	Retail.	Wholesale Per doz.	Retail.	Wholesale Per doz.	Retail.	Wholesale Per doz.	Retail.	Wholesale Per doz.
1.	24 in. x 14 in.	s. d. 11	s. d. 8 0	s. d. 3 3	s. d. 33 0	s. d. 2 9	s. d. 26 0	s. d. 4 6	s. d. 46 0
2.	27 in. x 16 in.	1 2	10 0	4 0	42 0	3 3	33 0	5 9	60 0
3.	30 in. x 18 in.	1 4	12 6	5 0	52 0	4 0	40 0	6 9	74 0
4.	33 in. x 20 in.	1 7	15 0	6 0	64 0	4 6	49 0	8 0	88 0
5.	36 in. x 22 in.	1 10	18 0	7 0	77 0	5 5	59 0	9 6	106 0
6.	39 in. x 24 in.	—	—	—	—	—	—	—	—
7.	42 in. x 26 in.	—	—	—	—	—	—	—	—
8.	45 in. x 28 in.	—	—	—	—	—	—	—	—
9.	48 in. x 30 in.	—	—	—	—	—	—	—	—
Oversizes ...		7d.—9d. per sq. ft.		1s. 9d.—2s. per sq. ft.		1s. 7d.—1s. 8d. per sq. ft. (and up to 3s. 6d. or 4s. per sq. ft. if required specially shaped).		2s. 6d. per sq. ft.	

Standard sizes above No. 5 are seldom if ever stocked, and can usually be charged for almost at the rate of "oversizes." What are called "slips" are stock sizes 12 in. wide by 27 in., 30 in. or 33 in. long.

Oversizes are mats made singly or in small quantities to a customer's special requirements, and they will be by far the most profitable kind of order for the small worker. Motor car owners often require a special shape or size to suit the foot boards or the body of their cars, and have to pay fancy prices to dealers in motor accessories for them. The worker should canvass garages near him, and car owners also, both for orders and to advertise the fact that he can supply these special articles. He may often indeed get better prices than those mentioned above for this class of work.

1. **Reversible Mats.**—These are made entirely of coarse fibre spun yarn loosely double stranded, which is sold in several grades of quality at prices from £15-£20 per ton. Assuming that the small worker bought in smaller quantities he might expect to have to pay on an average 20s. per cwt.

For appearance sake, it is usual to dye a border all round the edge, 2 to 3 in. wide in a bright colour. The cost of the dye depends rather on the colour used, but should not exceed 10s. to 12s. per lb. An exceedingly small quantity is required per mat. Half a pound of dye should be sufficient for 16 doz. mats of No. 1 size, or 12 doz. of No. 2 or 10 doz. of No. 3. The outfit required for making consists of a reversible mat-making frame with rod and needle, a narrow dyeing trough of sufficient length to accommodate the longest side of the largest mat intended to be made, and a knife. The total cost of these would be about £9. The operation of making these mats is very simple, and the use of the frame can be learnt in a few hours, although the speed necessary to make the work pay can only be acquired with practice. The dyeing of the border is still easier and can be done by a boy or girl. Sufficient of the dye dissolved in water is placed in the trough and kept hot. Each edge of the mat is then dipped in turn and held in the solution for 10 or 15 seconds. It is usual to dip two mats at a time. Dipping should proceed at the rate of about two mats per minute, and the mats should then be hung over a rope for an hour or two to dry.

The rate of production by an experienced worker should be about 8 to 10 sq. ft. of matting per hour.

Costs Example.

1 doz. No. 2 Reversible Mats (1 ft. 4 in. × 2 ft. 3 in.)

Material—

18 lb. of yarn at 20s. per cwt. say ...	...	...	...	s.	d.
Dye ($\frac{1}{2}$ lb. for 12 dozen) ...	...	...	...	3	2½
					5

Labour—

Making—4 hours charged at 1s.	4	0
Dyeing at 100-120 per hour at 1s.		1½

Prime cost of 1 dozen mats ...	7	9
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It will be seen that both wholesale and retail selling prices leave a good margin of gross profit after the worker has allowed himself 1s. an hour for his labour. This gross profit, however, has to cover overhead charges, possibly including costs of carriage on material and finished goods, time spent in calling on customers or looking for orders, etc.

2. **Sinnet or Skeleton Mats.**—The making of these mats requires but a very simple outfit, but they may not be found

always so readily saleable as other kinds, and the worker must acquire skill and rapidity in the use of the sailmakers' needle and palm.

The equipment required is a stout wooden frame (with iron plates sunk into it), a sewing palm and a few medium-sized sailmakers' needles of various shapes. The plates in the frame have holes in them to take pegs which define the corners of mats of the various sizes (Fig. 1). Total cost £3 to £3 5s.

This simple and cheap apparatus would suffice for the trained or experienced mat maker, able to calculate for himself the correct sizes of the loops, which vary for different sizes of mats. The beginner, however, would probably find this a difficult and complicated process, leading to mistakes and loss of time, and it would be better in this case to use special frames which are obtainable adapted for making one size of mat only. Greater accuracy and speed in working will result, but he will be put to more expense on his outfit in the first instance.

Prices for these special frames are :—

No. 2 size	£2 0s.	No. 4 size	£2 10s.
No. 3 „	£2 5s.	No. 5 „	£2 15s.

So far as standard size mats are concerned, the use of the special frames will make the work quite simple.

Outsizes are seldom required in this type of mat, but when they are they cannot be made on the standard frames sold, but pegs must be driven into the floor or table in the proper positions to suit the required size and shape. Outsizes could only be produced by a worker of sufficient skill and experience to work out correct loop sizes for himself.

Sinnet mat frames are not self supporting, but the worker will require a table to lay them on whilst using them.

The mat itself is made from a single length of plaited fibre yarn, the plait being about 1 in. wide by $\frac{3}{8}$ in. thick for No. 3 mats and above. This can be purchased ready for use at about 50s. per cwt. It is twisted or bent by hand into the open work pattern required, and stitched up where needed with stout pack thread, sewing twine or fibre yarn.

Very little training is wanted to make this simple kind of mat, but a good deal of experience will be found necessary before mats can be produced rapidly and neatly.

The size perhaps most commonly in request would be the No. 3 (30 in. \times 18 in.), and an experienced worker should be able to make them at the rate of about 1 an hour.

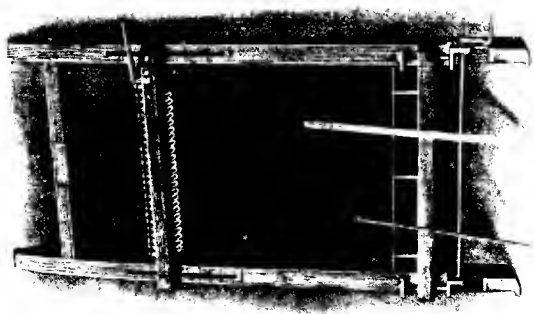


FIG. 1.—A Reversible Mat Frame.

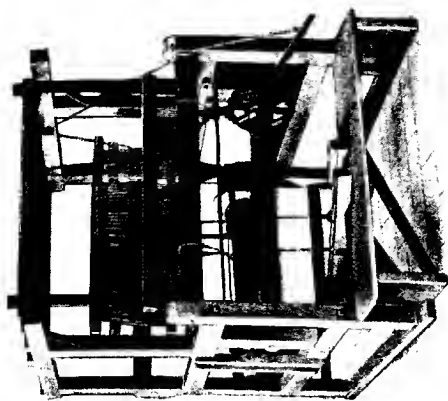


FIG. 2. Loom for making Felt and Wool Bordered Mats.

Cost.—The cost of making 1 dozen No. 3 Sinnet mats is about as follows:—

Material—					£	s.	d.
56 lb. of plait at 50a. per cwt.	...	...	...	...	1	5	0
Sewing twine	...	...	...	...			3
Labour—							
12 hours at 1s.	...	...	...	...		12	0
Prime cost of 1 dozen					£1	17	3

and this size should retail at about 5s. each.

Sinnet mats can also be dyed at the corners or along the edges if desired.

3. **Loom-Made Coir Yarn Mats.**—This type of mat should be the most easily saleable, and is also that most often required in outsizes by car owners and garages. They are made on a hand loom almost exactly similar to the old-fashioned cottage loom formerly used for weaving homespun cloth, but more heavily and stoutly built, mat making being much heavier work than cloth weaving, as the yarn is coarser and the tension of the warp higher.

The equipment required will be the loom with its harness, reed, shuttles or needles (Fig. 2); scissors, shears, cutting-out rod and knife, a simple spool winder, and needle and palm for sewing on the edge binding. The total cost of these would be about £22 to £24.

In addition, if the worker is to beam on his own warp this will require a beaming frame and a raddle at an extra cost of approximately £5. A clear floor space of about 45 ft. by 6 ft. wide will be needed for this operation. This job can of course be done out of doors, but it cannot be undertaken single handed. The worker will in fact require two assistants, one of whom may be a boy, during the operation, which, however, need not be a very frequent one as he should beam on 50 to 100 yards of warp at a time which would be sufficient for 7 or 8 doz. No. 3 size mats. If he is a spare-time worker only this should last for a month or so. The operation would take 3 to 4 hours, including resetting the loom. It is probable that the suppliers of his equipment would do this for him if required, but it will decidedly pay the worker to do it himself if possible.

Space does not admit of describing how the loom is set up for working—the method is almost exactly similar to that described in publications on hand-loom weaving; but after the warp is stretched through the harness and the reed, the way the mat itself is formed is briefly as follows:—

The yarn for the pile which the worker obtains in bales is made up into balls for convenience in working, and two strands of this yarn, taken

together are worked under and over the warp threads, like a kind of coarse spiral spring, the full width of the mat. This is done very rapidly with the fingers and thumb, which must be protected with metal finger stalls from the chafing which would be caused by the very coarse fibre yarn.

The cutting-out rod consists of a long, narrow U-shaped blade of steel. This is slipped inside the loose spiral of yarn, open side upwards, above the warp threads, and the whole is then closed up by a heavy blow with the reed. The worker then inserts the blade of his knife between the two top edges of the cutting-out rod, and passes it rapidly across the whole width. This cuts all the threads at the top of the spiral and forms a double row of pile across the mat. The cutting-out rod is pulled out, another blow given with the reed, and then a couple of threads of the same material woven in to bind the pile. These intermediate or weft threads are put in with the shuttle while alternative threads of the warp are lifted or depressed by the harness, and each is driven tight with the reed. A fresh line of pile is then put in, and so on, till the loom work on the mat is completed.

The sequence of operations described above takes only a few seconds in reality, but the work is more arduous than weaving woollen cloth by hand.

On removal from the loom a length of plait $\frac{1}{2}$ in. wide, say, is sewn on all round at the base of the pile holding the loose ends of the warp threads in place, and to keep the mat neat and in shape. It will be wise for the inexperienced worker at first to knot alternate loose ends of warp together and with the plait at intervals, or he may find his mats coming to pieces at the ends.

The mat is now ready for the last operation, viz., trimming. The pile as left from the cutting-out operation in the loom will be very uneven, and requires trimming flat with a pair of heavy scissors or shears—the former are best for coir and the latter for wool borders or all-wool mats. The mats should be laid on the worker's bench with one edge overhanging it and trimmed right across at this point, then moved a little further over and the process repeated until the whole is of an even thickness. The mat is prevented from slipping off the bench during this operation by placing a weight on it.

Cost of Material.—The approximate cost of the materials used is as follows:—

Coir yarn for pile, ordinary quality, about 28s. per cwt.	
do. do. good quality (motor car work) 33s. to 34s.	
do. for warp and weft	28s.
$\frac{1}{2}$ -in. plait for binding	60s.

Costs Example for 1 dozen mats, size No. 3—

Material—		£	s.	d.
Yarn for pile, 32 lb. at 33s. per cwt.	...	...	0	9 5
Yarn for warp and weft, 8 lb. at 28s. per cwt.	...	...	0	2 0
Plait $2\frac{1}{2}$ lb. of $\frac{1}{2}$ -in. at 60s. per cwt.	...	...	0	1 4

Labour—

Proportion of beaming on coats ($\frac{1}{8}$ say) ...	...	0	1	0
* Baling yarn from hales— $\frac{1}{4}$ hour.				
Making up—14 hours.				
Trimming and binding—6 to 7 hours.				
Say 21 hours at 1s. ...	...	1	1	0
Prime cost of 1 dozen ...	...	£1	14	9

Each ... 0 2 10 $\frac{1}{2}$

This size should retail at 4s. each, or even more for best quality mats.

* Baling and spool winding can be done by a boy or girl.

4. **Vandyked or Straight Wool Bordered Mats.**—These are made on the loom and with practically the same equipment as in the last case, but the materials are of rather better quality. The type of mat in question has its central portion of coir or coconut fibre as before, but round the edge is a pattern worked in wool of various colours. The warp threads, or rug warp as it is termed, in this case are of a fairly fine linen thread, and it is better in this case to have the beaming on done by the maker of the loom, unless the worker is going in for manufacture on a fairly large scale or on a whole-time basis. A 200-yd. length of warp would be put on at a time, sufficient for about 14 doz. No. 3 mats. To get this done would cost about £3 15s., and would last the spare-time worker some months. The weft yarn is a soft jute cord woven in with the shuttle in the ordinary way, and the wool border is produced by using woollen yarn twisted in, but over a width of a few threads of the warp only on either side of the fibre centre, in exactly the same way as the coir fibre pile was created in the last example describing coir mat making, balls or spools of wool of the colours required being hung at the side of the loom.

These mats are not bound with plait, but at the beginning and the end a short length (about 2 in.) is woven, using a shuttle carrying a rather thinner jute yarn or binding twine. When the mat is removed from the loom these end pieces are doubled over underneath the mat at each end and sewn up.

Trimming of the faces is required as for coir mats. The wool border should be trimmed with the shears to a level below that of the fibre centre portion.

Cost of Material.—The wool used is of a much cheaper grade than that usually employed in rug making. Prices vary according to colour from about 1s. to 1s. 1d. up to 1s. 8d. per lb. Black and red are among the cheaper colours. Blues, yellows, greens, etc., are more expensive.

Cost of Making 1 dozen No. 3 Wool Bordered Mats—

Materials—			£	s.	d.
Wool, 10 lb. at 1s. 2½d. per lb.	...	...	...	0	12 0
Jute, 15 lb. at 28s. per cwt.	...	...	...	0	3 9
Fibre, 48 lb. at 14s. per cwt.	...	...	...	0	6 0
Binding, 1 lb.	...	...	...	0	0 4
Linen yarn, 3½ lb. at 1s. 8½d. per lb.	...	...	...	0	6 0
Labour—					
* Pulling off wool and teasing fibre—3 hours	...	...	...	0	1 6
Making (46 sq. ft.) 25 hours at 1s.	...	...	...	1	5 0
Trimming—6 hours at 1s.	...	...	...	0	6 0
Prime cost of 1 dozen...	...	...	£3	0	7
Each ...	...	...	...	0	5 0½

Retail selling price should be 6s. 6d. to 7s.

* Can be done by a boy or girl.

All Wool Mats.—With the same equipment and using the same warp as for the wool-bordered type, by replacing the coir fibre centre portion with a suitably coloured wool-bordered all-wool mats can be made in a great range and variety of patterns and colours. The cost of these would be from 40 to 60 per cent. above that of wool-bordered mats of the same size.

In this style there would be a more frequent demand for special or outsizes—they are often required by car owners to fit in a particular position, or in a shade to match existing upholstery. Another special use besides the ordinary domestic one is seating mats for pews in churches, chapels and other institutions.

Rug Weaving.—By using a better quality wool and leaving a thicker pile on the finished article, woollen rugs can also be made on the loom with very much less expenditure of time on labour than is necessary where the common band methods are employed. While rug making, as mentioned in a previous paragraph, is not often likely to be at all a paying proposition undertaken by itself, it should be quite possible to execute on the loom occasional orders at quite a reasonable price. These rugs will always, however, be fairly expensive owing to cost of material, and consequently sales will be generally too small to provide steady work at them; and it would be unwise, even if possible, to lock up money in accumulating a stock.

Coconut Matting.—Coir, or what is often called coconut matting, as well as sacking material for making up into coal bags, sacks, etc., can also be made on the mat loom without any difficulty, but it will seldom, if ever, be possible to compete

in this class of goods with the factory, to say nothing of the products of cheap native labour imported in quantities from India and elsewhere. Individual workers in a small way, therefore, are not advised to attempt it unless they are certain of being able to buy their material at specially favourable rates and to sell their output at an unusually high one.

Trimming by Machine.—In describing the process of making coir yarn and woollen mats and rugs above, we have referred to the trimming of the pile to an even thickness as being done by hand with scissors or shears. Shearing machines, either hand or power operated, can, however, be got for this purpose, and one of these would be a very useful addition to the equipment of any worker whose output is at all large; by the use of the shearing machine uniformity of thickness is automatically attained with an immense saving of time and cost of labour.

These machines are rather expensive, a 30-in. hand-operated shearer costing between £70 and £80, but it should pay the worker to instal one, if he finds he can dispose of a whole-time output. Possibly in some cases, two or three workers in the same district might be able to share one, or pay for the permission to use it, if it was the property of one of them only.

Training.—For the majority of the operations described in these notes, little training is necessary beyond some instruction in the handling of the equipment or the loom—the necessary skill would follow with experience in working. One firm of manufacturers of mat-making equipment has informed us that they would be prepared to give this necessary instruction at their works to purchasers of their apparatus.

The Bureau will be glad to answer inquiries arising from these notes, and to furnish on request particulars of manufacturers and suppliers of the equipment and materials described.

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THE LONDON POULTRY MARKETS.

C. A. FLATT.

Ministry of Agriculture and Fisheries.

PROBABLY in no other market in the United Kingdom can so fine a collection of poultry be seen as the displays in the London markets of Smithfield and Leadenhall at Christmas time. These markets receive a large proportion of the turkeys and ducks from East Anglia, geese from the fen country and fowls from the fattening districts of Sussex. Although poultry of

good quality come to these markets from all parts, production and marketing has reached a higher standard, and is to some extent better organised, in the areas particularly mentioned.

This not only applies to the Christmas festival, but at all seasons of the year English poultry of the finest quality is to be found in the London markets. There is, however, a large quantity of English produce of inferior grade sent to London, and it has to compete with foreign supplies.

Poultry of all classes is imported to Great Britain from the Dominions and from foreign countries, and a large proportion of it comes to the London markets. Much of it is of very fine quality, and is produced to meet a definite demand and to arrive at favourable seasons.

Christmas Markets.—Some indication of the importance of our markets to the foreign producer can be gained from the following figures, which show the arrivals of British and foreign poultry and game into Smithfield Market during the month of December for the year 1922, with comparisons in the years 1921 and 1918.

	1918.	1921.	1922.
<i>British and Irish</i> ...	1,579 tons.	2,089 tons.	1,762 tons.
<i>Foreign</i> ...	1,302 „	553 „	1,317 „

It will be seen from these figures that the foreign producer has regained the position he held on this market before the War so far as quantity is concerned, and the figures give some idea of our Christmas bill for foreign poultry.

For the Christmas trade, turkeys, which arrive from France in considerable quantity, compare very favourably with the Norfolk turkeys, geese from Normandy and Holland are of exceptionally fine quality, while fowls from these countries also stand well in the markets. In addition, large numbers of turkeys of a lower grade come from southern Europe.

Ireland, which is included in the return with the British supplies, also sends large consignments of poultry of all classes, and a long study of the market requirements has led to great improvement in the quality and method of marketing of Irish produce.

Smithfield Market Returns.—Some further figures from the Smithfield Market Returns are given below to illustrate the steady growth of foreign competition. In these Returns the figures for British and Irish produce are not given separately, and game is included with poultry, but suitable deductions can be drawn.

	1913.	1921.	1922.
<i>British and Irish</i> ...	8,526 tons.	11,711 tons.	12,060 tons.
<i>Foreign</i>	5,230 "	1,936 "	4,353 "

Here again the recovery of the foreign supplies is notable, but in the figures for the first nine months of the present year, the increase is still further apparent. The figures for the same period of 1922 are given for comparison.

	1922. (1st nine months.)	1923. (1st nine months.)	Difference.
<i>British and Irish</i> ...	7,556 tons.	6,733 tons.	- 823 tons.
<i>Foreign</i>	2,769 "	3,695 "	+ 926 "

This increase of 926 tons in foreign consignments for the first nine months of 1923 is notable, especially in conjunction with the fact that, of the total of 4,993 tons imported in 1922, 1,317 tons were received in the month of December alone. It is also significant that this increase has mainly taken place in supplies from "Holland and other countries," whose imports have increased by 849 tons. North America shows an increase of 96 tons, and South America of 17 tons, whilst Australasian supplies have decreased by 36 tons.

There is, on the other hand, a decrease in the same period of supplies of British and Irish birds. This decrease in the nine months outweighs the gain in the 12 months of 1922 over the 1921 supplies.

Market Requirements.—Reference has already been made to the supplies for the Christmas markets. Of the poultry received at other seasons, the American box chickens of about 3 lb. weight are well favoured on the market, and French poultry meets a ready demand. A new feature on the market this year were Belgian fattened fowls almost comparable with "Surrey" fowls. They arrived late in the season, but realised within a few pence per lb. of the price paid for the latter.

The demand for poultry varies to some extent at different seasons (see Leaflet No. 201), but there is plenty of evidence to show that special demands can be created for any class of produce if this is of good quality. It is doubtless the poultry-keeper's first business to study the normal demands of the market and to endeavour to supply these, but if for other reasons the class of poultry produced is not such as to meet the normal requirements, there is every reason to suppose that if this particular product is put on to the market in the best possible manner, a good trade will be found.

Complaint is sometimes made of the returns received by producers for poultry sent to London salesmen. These can be accounted for in various ways.

A large quantity of the poultry received in the markets is badly finished, birds being ill fed, badly prepared and carelessly packed. Consignments are also irregular and frequently sent without sufficient warning to the salesmen.

It is probably a fact with poultry, as it is said to be with other goods, that London will absorb any class of product, but the producer of inferior quality poultry will seldom gain by sending long distances to this market. On the other hand, birds of good quality are frequently spoilt by ignorance in their preparation and in packing. In the first case the inferior birds will probably sell equally well in live condition at a local market, and in many cases these birds will be brought into better condition by the purchaser before they are eventually killed. If the producer intends to market the birds dead, he should first bring them into fit condition. Care in the details of marketing is very important; appearance adds much to the value of the product, and uniformity in the quality of the birds in a consignment is very desirable.

Where regular consignments are sent to a salesman, he is in a position to find a steady outlet for these at a satisfactory price, and in dealing with regular and large quantities of good quality produce the London markets seldom fail. Even when small consignments can only be sent at irregular intervals, if these are of good quality and the salesman is notified to expect them at a given date, satisfactory results follow. In supplying a large market like Smithfield, however, some knowledge and organisation is required. The exporter of foreign produce studies his market carefully, and directs his supplies accordingly. These supplies are also sent in larger consignments, and are consequently handled by the salesman with more economy in labour.

To effect similar results with English poultry, organisation is badly needed. In some areas the organisation has grown; the fatteners of poultry in the Heathfield and Uckfield districts and the duck fatteners in Norfolk, for instance, can be sure of their produce meeting a ready sale in the London markets. If English producers of poultry in other areas are to meet the increasing competition from abroad upon more equal terms, especially in this important market, it can only be done by a study of market requirements with a view to the adoption of better methods by the producer, and by some organisation for the regulation of supplies.

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THE IMPERIAL FRUIT SHOW, 1923.

J. TURNBULL and A. WHITING,
Ministry of Agriculture and Fisheries.

THE third Imperial Fruit Show which was held at Manchester differed considerably from all previous fruit shows. In the first place it has been wholly organised and financed by the fruit industry itself. That fact augurs well not only for future fruit shows, but for the whole future of the industry. It completely refutes the too commonly expressed view that it was impossible to combine such completely opposing interests as those of the different sections of the fruit industry.

The two primary objects of the show, viz., to improve the presentation of apples by better grading and packing, and to stimulate the demand for apples by the consumer—have been notably advanced. The idea of having with each exhibit an extra package to be shot out for the purpose of judging, left the remainder of the exhibit undisturbed—adding to the general attractiveness of the display and further demonstrating good and poor methods of packing. It also provided exhibition fruit for retail sale. Visitors were able to taste apples at the stand of the Federation of British Growers and then pass on to the retail stand to purchase apples. So popular was this feature that the exhibition fruit was cleared out quite early during the show. It is the most effective move that has yet been made in stimulating the demand, and should play an important part in the organisation of future fruit shows. Arrangements might even be made whereby the public could purchase whole exhibits if the latter were priced by a valuing committee. The improvement in the general level of packing is very marked. The adoption of a standard method of box packing has greatly reduced the difficulties of newcomers in arriving at a suitable pack for different varieties and sizes. In the past, the Kent section has been well in advance of the East and the West, but now there is little to choose between the different sections. There are now more growers able to put up a sound commercial pack, with the consequence that few exhibits fall short of the exhibition standard. The display of the judges' score card in each class again attracted the lively interest of the growers attending the show. The display of cards showing the merits and uses of each variety was a useful innovation, and added materially to the propagandist value of the show. The shortness of the crop

resulted in a decrease in the number of entries, but quality was well maintained notwithstanding that the growing season was remarkable for the severity of the attacks of insect and fungus pests.

Section.	Numbers in 1922.		Numbers in 1923.	
	Exhibitors.	Entries.	Exhibitors.	Entries.
British Empire—				
United Kingdom	24	39	14	34
Canada	9	17	4	5
Australia	5	6	3	3
South Africa	7	9	—	—
Overseas	13	92	6	28
Kent and Southern	47	222	17	89
East and Northern	43	187	38	109
West and Midlands	29	128	17	76
Irish	44	71	9	11
Channel Islands	68	85	7	8
United Kingdom*	30	58	10	19

* In addition to other classes included above.

Apples.—*British Empire Section.*—Contrary to last year's experience, the best exhibits in the show were to be found in this section. This is as it should be and was no doubt in some measure due to the reduction from 20 to 10 in the number of packages required. The most striking feature of the section was the very high level attained by the great majority of the exhibits. In most cases the apples were almost perfect specimens and their condition showed that the greatest attention had been paid to every detail of picking, storing, grading and packing. It is obvious that if these details maintain such a high standard at future shows competition will be so keen that one blemished specimen may be the deciding factor in making an award. The judges had the greatest difficulty in differentiating and attention had to be directed to quite minor points of detail, such as trueness to type, before a decision in some cases could be reached.

In the dessert class, there is always keen competition between Cox's Orange Pippin and McIntosh Red. In this country we hold the view that the flavour and texture of good Cox's Orange Pippins are unapproached, but the Canadians maintain that McIntosh Red holds the premier position in this respect. No one could doubt, however, that the exhibit of McIntosh Red from British Columbia deserved first place. This was a collective exhibit from an Association of Growers who naturally had more opportunity to obtain a perfect selection of fruit. There was not a single blemished apple in the turned out package, and it is

doubtful whether more perfect quality and finish for this variety could be obtained. Possibly the pack might have been considered a shade low at the ends and not absolutely solid. The second prize went to Cox's Orange Pippin from Malvern. Against the McIntosh Red these looked a little dull and russety, with some blemishes round the stalk end. Grand specimens as they were, the finding of several fruits with slight cracking near the stalks was sufficient alone to reduce the points awarded under "condition." The size (188) was about right for the variety and gives a solid pack standing up well under show conditions. If any criticism could be made, it would be that the pack looked a little flat. The third position was reached by McIntosh Red from Quebec. These were not so bright as the winning exhibit, being a little bruised and the pack rather slack. The fourth place went to Allington Pippins, also from Malvern, typical of the best of this variety, and of fine size (175); the pack was perhaps a little flat-looking as was the case with the Cox's Orange sent by this exhibitor. The fifth place was also given to Allington Pippins, this time from East Suffolk. They were well coloured, but the skin quality was not quite up to the last named. An exhibit of Worcester Pearmain, which was almost perfect, well coloured and packed, lost on condition and flavour quality. It would appear that this variety cannot hold its own in such a competition at a date so late in the year. A good exhibit of Cox's Orange Pippin put up by the Essex Growers' Branch of the Federation of British Growers won the Gilroy Challenge Cup.

In the culinary class the premier award was gained by an exhibit of Blenheim Orange from Warwickshire. These were an almost perfect sample of this variety, well packed and 96 to the box. The second place was secured by Lane's Prince Albert, sizes 80 and 88, from Malvern. They were not quite uniform in condition and quality, and the pack was a little uneven, but freedom from any form of blemish or bruise was very noteworthy. The third position was awarded to an exhibit of Lord Derby from Kent—a very good sample of the variety, but not quite up to size (88 to the box). They showed a little hail damage and the pack was rather flat in some boxes. The fourth lot were of the variety Wagener, from British Columbia. They were on the small side for a cooking apple—size 113—appeared to have been badly picked, and the pack was rather slack in three boxes. The condition and skin quality, however, were again typical of perfect selection by the British Columbia

Growers. The fifth, Charles Ross (88 and 96 to the box), were not uniform in size, shape or quality, and the pack was a little uneven. Very fine Newton Wonders from Malvern secured high points for packing, but lost points on condition and quality on account of bitter pit. Very fine Bramley Seedling from East Suffolk showed slight bitter pit and were rather slack in the pack (88 to the box). Bismarcks from Essex also showed a little bitter pit and the tight pack had bruised some apples against the ends of the box. There was evidence here of slight jamming in of the unwrapped layer.

United Kingdom Section.—Cox's Orange Pippin.—The first prize in the box class went to Herefordshire for well packed Cox's of outstanding colour and quality. The second, from Essex, were not quite such a typical colour and the pack also not quite so good—size 188. The third, from Berkshire, were of fine finish and colour, but the pack was rather slack and low. The first prize in the half-sieve class went to Devonshire for an exhibit of fine colour, finish and skin quality, a good size, uniform and well packed. These were probably the best conditioned Cox's in the show, and realised at auction 36s. per half-sieve. The second from Herefordshire were well packed and of an attractive appearance, but they were in soft condition and not uniform.

Worcester Pearmain.—The first prize lot came from Norfolk and were almost perfect in every way, receiving 95 per cent. of marks, size 188. The second from Kent were also very fine, size 175. The wrapping paper showed "tails" in the spaces. The third from Evesham were below the others in colour and condition, but were very well packed. In the class for Any Other Variety (except Cox's Orange) in half-sieves, Worcesters were awarded second and third places, being beaten only by an outstanding example of King of the Pippins.

Allington Pippin.—The first prize went to Herefordshire, Allington's of exceptional colour though rather small (216). The second, from Kent, were fine specimens, but too many sizes, most of which should have been packed 3-2. The third, from Kent, were well packed, bright fruit but rough skinned. The exhibits from the Eastern Counties were unfortunate in not being "placed" in this class as some had nearly full points for colour, finish and condition, and the pack was good. The majority also were more typical of the variety than more highly coloured fruit from Herefordshire.

Blenheim Orange.—The first prize for dessert Blenheims in boxes went to Kent for a sample of bright colour and good condition very solidly packed. The size (112 packed 2-2) is rather large for dessert, but a smaller size means a 3-2 pack with wide spaces, which is apt to shift under show conditions when the top layer must not be wrapped. The second, from Evesham, were not so bright and level in colour and the apples were not uniform in size.

Any Other Variety.—*Dessert*.—In boxes the first prize was won by a Herefordshire exhibit of King of the Pippins, outstanding in everything except condition. These were followed by very good Gascoyne's Scarlet from Essex, which made the same price, viz., 20s. per box, and for third place by King of the Pippins from Worcestershire. In half-sieves this class included all varieties except Cox's, and the first prize again went to Herefordshire, King of the Pippins much like the first, mentioned above.

(To be concluded.)

* * * * *

NOTES ON MANURES FOR DECEMBER.

H. V. GARNER, B.A.,

Rothamsted Experimental Station.

Signs of Starvation.—The yellowish appearance of plants which are suffering from a shortage of available nitrogen, as for example in the case of winter-sown cereals in a wet cold spring, is well known. It is perhaps not so generally recognised that deficiency of potash also produces marked symptoms in such potash-loving crops as mangolds and potatoes. On Barn Field, at Rothamsted, where mangolds have been grown without potash on certain plots for many years, their appearance this year has been far from normal. The leaves became wrinkled, flabby, of a very dark green colour and tended to wither at the margins, while the leaf-stalks were much yellower than is normally the case, and the whole plant was stunted. Potatoes grown without potash showed rather similar effects. The growth was poor, the leaves were dark blue-green and dying-off was premature. Needless to say, the yield of tubers has been seriously reduced. The above effects are only seen

in extreme cases, but complete omission of potash manures for a single season will often produce them in the case of potatoes.

Top-Dressing the Nurse Crop.—In a recent experiment at Rothamsted, barley undersown with red clover had been top-dressed at a time when the young seeds were just appearing through the ground. The dressings per acre were :—

- (1) Superphosphate 2 cwt.
- (2) Superphosphate 2 cwt. + Sulphate of Ammonia 1 cwt.
- (3) Superphosphate 2 cwt. + Sulphate of Ammonia 2 cwt.

These dressings produced their usual effect on the barley crop. Superphosphate alone had little effect on the crop, which was not visibly different from barley without manure, but each addition of sulphate of ammonia gave a marked increase of grain and straw. On examining the clover plant after the barley had been removed it was noted that the dressing of superphosphate had resulted in a very good plant of seeds; the addition of 1 cwt. of sulphate of ammonia had very slightly damaged the plant, while the double dressing had been distinctly destructive. It would seem advisable in similar cases to limit the nitrogen as dressing to about 1 cwt. per acre and apply it at barley sowing. Where mixed grasses and clovers are sown the effect would not be so marked, as any loss of clover would be compensated in part by the increased growth of grass obtained from the sulphate of ammonia.

In another experiment on the influence of manuring on the malting quality of barley, one plot of barley had the sulphate of potash omitted from the complete artificial mixture while all the others received potash. The effect of the omission was not so marked in the barley crop, but the clover under the barley showed a striking depression below the level of the remaining plots which had received potash. The above effects serve to bring out the importance of considering manuring in relation to a sequence of crops rather than to the one which will actually receive the application.

Storage of Fertilisers.—Prices of artificial manures tend to vary with the season of the year, being slightly higher when they are wanted for immediate application than at other times. Quick-acting fertilisers are in most demand in March, April and May, while basic slags are more taken up in the autumn and winter months. A manure shed on the farm enables the farmer to take advantage of these small differences by buying in his supplies at a favourable price and storing them under

good conditions until required. He is also independent of possible delays in delivery in the busy seasons. Dryness is the essential for a manure shed. A concrete floor for mixing purposes and wooden bins to hold the fertilisers in bulk or in bags are desirable. Most of the common fertilisers can be kept indefinitely in a dry shed without chemical changes taking place. A certain amount of atmospheric moisture may be taken up and cause lumps to be formed, but these are easily dealt with on the floor either with a wooden rammer or the back of a shovel.

Dry neutral sulphate of ammonia keeps in better condition than the ordinary grade and does not rot the bags. Lime cannot be stored in bags for any length of time. Casks of nitrate of lime should only be opened as required, as any unused excess tends to become moist when exposed to the air.

Grass Land.—The manurial requirements of pasture and meadow land may be regarded in the light of the losses of fertilising constituents which each type of grass land suffers in the ordinary course of farming. A few approximate figures are given of the losses sustained by one acre of grass land in its period of maximum productivity during the five months of summer grazing or the growing season of the first hay crop as the case may be. The losses of nitrogen, phosphate and potash are calculated as nitrate of soda, 30 per cent. superphosphate, and 12 per cent. kainit respectively.

Type of grass land.	Produce removed per acre.	Taken from the land.		
		Nitrogen as Nitrate of Soda.	Phosphate as 30% Super.	Potash as Kainit.
Fattening pasture stocked with full-grown beasts.	250 lb. fattening increase.	lb. 19	lb. 10	lb. 1
Medium store land stocked with yearling stores.	200 lb. live weight increase.	37	26	3
Medium hay land.	20 cwt. hay.	205	59	282

It will be seen that the mature animals make little demand on the fertilising constituents of the pasture. The nitrogen removed would be amply provided for by the cake feeding which is commonly received at some period of the year. An application of basic slag, superphosphate or bone meal every four years would maintain the phosphate and tend to balance the added nitrogen of the cake. Potash manures would not commonly be required on such land.

Grazing with stores takes more out of the land. A phosphatic dressing (5 cwt. per acre of 40 per cent. basic slag or its equivalent) applied every 4 or 5 years will generally provide the necessary phosphate and also the nitrogen by the agency of the clover which usually appears after phosphates are applied to stiff land. If slag appears to have little effect the land may be sour (in which case the only remedy is an application of some form of chalk or lime), or potash may be deficient, when a dressing of 4 cwt. per acre of kainit in addition to the slag will often give satisfactory results.

The hay crop is exhaustive of all constituents, particularly of potash and of nitrogen, and complete and fairly generous treatment is required to maintain permanent meadow land. If dung can be spared it may be used at the rate of about 10 tons per acre every 4 years. In each intervening year a complete artificial mixture can be given consisting of 2 cwt. of superphosphate and 3 cwt. of kainit per acre in autumn, and 1 cwt. per acre of nitrate of soda, sulphate of ammonia, or nitrate of lime in spring. The above, with residues of foods fed on the aftermath, should keep up production. If the land tends to become sour, an autumn dressing of 10-15 cwt. per acre of ground lime or its equivalent (1-1½ ton) of ground limestone may be applied every 3 or 4 years, and in the year of liming the artificial mixture could be omitted.

* * * * *

PRICES OF ARTIFICIAL MANURES.

NOTE.—Unless otherwise stated, prices are for not less than 2-ton lots f.o.r. in towns named, and are net cash for prompt delivery.

DESCRIPTION	Average Price per ton during week ending November 7th.				
	Bristol	Hull	L'pool	L'ndn	Cost per Unit at London
Nitrate of Soda (N. 15½ per cent.) ...	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
" " Lime (N. 13 per cent.) ...	13.15	13.10	13.2	16.11	19.3
Sulphate of Ammonia, ordinary (A. 25½ per cent.)	13.12*	13.12*	13.12*	13.12*	(N)13.1
" " " neutral (A. 25½ per cent.)	14.15*	14.15*	14.15*	14.15*	(N)13.11
Kainit (Pot. 12½ per cent.) ...	...	...	...	2.5	3.7
" (Pot. 14 per cent.) ...	2.7	1.18	2.10	2.7	3.5
Sylvinit (Pot. 20 per cent.) ...	...	...	...	2.10	2.6
Potash Salts (Pot. 30 per cent.) ...	...	...	...	3.10	2.4
" (Pot. 20 per cent.) ...	...	...	...	2.5	2.3
Muriate of Potash (Pot. 50 per cent.) ...	8.5	7.0	7.0	7.0	2.10
Sulphate of Potash (Pot. 48 per cent.) ...	13.10	...	10.10	10.15	4.6
Basic Slag (T.P. 35 per cent.) ...	...	...	...	3.10§	2.0
" (T.P. 30 per cent.) ...	...	...	...	2.17§	1.11
" (T.P. 26 per cent.) ...	2.13§	2.5§	...	...	...
" (T.P. 24 per cent.) ...	2.9§	2.1§	2.0§	...	...
" (T.P. 20-22 per cent.) ...	...	1.18§	...	2.5§	2.3
" (T.P. 18 per cent.) ...	2.3§	...	1.15§	...	...
Superphosphate (S.P. 35 per cent.) ...	3.13	...	3.7§	3.5	1.10
" (S.P. 30 per cent.) ...	3.6	3.0	3.0§	3.0	2.0
Bone Meal (A. 4½ T.P. 45 per cent.) ...	9.10	8.10	9.0	8.10	...
Steamed Bone Flour (A. 1. T.P. 60 per cent.) ...	6.5	6.10†	6.0	6.5	...
Fish Guano (A. 9-10, T.P. 16-20 per cent.)...	12.15	...	12.10	13.12	...

Abbreviations: N.=Nitrogen; A.=Ammonia; S.P.=Soluble Phosphate; T.P.=Total Phosphate; Pot.=Potash.

* Delivered in 4-ton lots at purchaser's nearest railway station.

† Delivered (within a limited area) at purchaser's nearest railway station.

§ Prices include cost of carriage from works to town named. Hull prices include delivery to any station in Yorkshire; London prices include delivery within a limited area. Cost to purchasers in other districts will be greater or less according to the distance of different purchasers from the works.

MONTHLY NOTES ON FEEDING STUFFS.

E. T. HALNAN, M.A., Dip. Agric. (Cantab.),
Animal Nutrition Institute, Cambridge University.

Soybean Cake and Soybean Meal as a Feeding Stuff.—Soybean cake and soybean meal are two useful feeding stuffs which do not appear to be as widely used in feeding practice as their feeding value merits. Both the cake and the meal are derived from the soybean (*Glycine hispida*), being the residue left after extraction of the oil by pressing and extraction by solvents respectively. The soybean is a leguminous seed, and is chiefly

cultivated in China and Japan, where it is used in many different ways as human food. Its chief characteristic is its high oil and protein content and easy digestibility. Average analyses, nutritive ratio and starch equivalent are as follows:—

	Moisture.	Protein.	Oil.	Carbohydrates. Soluble.	Carbohydrates. + fibre.	Ash.	Nutritive Ratio.	Starch Equiv.
Soybean ...	10.0	33.2	17.6	30.5	4.1	4.7	1:2	78.9
Soybean cake ...	14.5	42.4	7.0	25.8	5.0	5.3	1:1	69.1
Soybean meal ...	11.3	44.7	1.5	31.9	5.1	5.5	1:1	64.0

The above analyses, taken from the Ministry's Miscellaneous Publication No. 82, *RATIONS FOR LIVE STOCK*, enable a comparison to be made between the relative values of the bean, the cake and the meal. It will be seen that both the cake and the meal are very rich in protein, and are useful therefore as a supplement to cereal foods or any other starchy food materials. The protein, oil, and carbohydrates are very digestible, even with pigs the protein is 94 per cent. digestible, the carbohydrates are 92.4 per cent. digestible, and the woody fibre is also 60.5 per cent. digestible.

Value as a Feeding Stuff.—It would appear from the foregoing paragraphs that soybean meal and cake should prove useful feeding stuffs. Practical feeding trials bear this out. Feeding trials with the cake and meal were carried out at various agricultural institutions in Great Britain during the years 1909-1911. These trials were carried out with bullocks and dairy cows, and the soybean cake or the meal was tested against decorticated cotton cake or linseed cake. The results of such trials led to the following conclusions:—

(1) At the Midland Agricultural College feeding trials with dairy cows in 1911 showed that soybean meal was equivalent to linseed cake for dairy cows, and gave a better quality milk judged on the fat and butter tests.

(2) At the Edinburgh and East of Scotland College, feeding trials with bullocks showed that soybean cake was a healthy cattle food, and a satisfactory beef producer, and could be used with safety up to 5 lb. per head per day. Weight for weight, it was not quite equal to linseed cake as a meat producer.

(3) Dairy trials at Offerton, under the Durham County Council, showed soybean cake to be an effective substitute for decorticated cotton cake. Owing to its rich protein character it should not exceed 6 lb. per head per day.

(4) Danish experiments have shown that soybean cake and meal give a firm butter, and are quite useful for inclusion in

DESCRIPTION.	Price per Qr.	Price per		Manurial Value per Ton.	Cost of Food Value per Ton.	Starch Equiv. per 100 lb.	Price per Unit Starch Equiv.	Price per lb. Starch Equiv.	
		Cwt.	Ton.						
		s. lb.	s. £ s.	£ s.	£ s.	s. d.			
Wheat, British	—	—	9/7	9 12	0 15	8 17	71-6	2/6	1-34
Barley, British Feeding	—	—	8/6	8 10	0 12	7 18	71	2/3	1-20
" Canadian No. 4	—	—	—	—	—	—	—	—	—
" Western	30/-	400	8/5	8 8	0 12	7 16	71	2/2	1-16
" Danubian	30/6	400	8/6	8 10+	0 12	7 18	71	2/3	1-20
Oats, English, White	—	—	9/10	9 17	0 13	9 4	59-5	3/1	1-65
" Black and	—	—	—	—	—	—	—	—	—
" Grey -	—	—	8/9	8 15	0 13	8 2	59-5	2/9	1-47
" Scotch, White	—	—	10/-	10 0	0 13	9 7	59-5	3/2	1-70
" Canadian No. 2	—	—	—	—	—	—	—	—	—
" Western	29/3	320	10/3	10 5	0 13	9 12	59-5	3/3	1-74
" No. 3	28/-	—	9/10	9 17	0 13	9 4	59-5	3/1	1-65
" Feed "	27/6	—	9/7	9 12	0 13	8 19	59-5	3/-	1-61
" American -	24/9	—	8/8	8 13+	0 13	8 0	59-5	2/8	1-43
" Argentine -	23/9	—	8/4	8 7	0 13	7 14	59-5	2/7	1-38
Maize, Argentine -	38/-	480	8/10	8 17	0 13	8 4	81	2/-	1-07
" South African	36/9	—	8/7	8 12	0 13	7 19	81	2/-	1-07
Beans, Rangoon -	—	—	7/10	7 17+	1 12	6 5	67	1/10	0-98
Peas, English, Maple	—	—	14/6	14 10	1 8	13 2	69	3/10	2-05
" Japanese	—	—	25/6	25 10+	1 8	24 2	69	7/-	3-75
Milers' Offals :-	—	—	—	—	—	—	—	—	—
Bran, British -	—	—	—	7 0	1 6	5 14	45	2/6	1-34
" Broad -	—	—	—	8 0	1 6	6 14	45	3/-	1-61
Middlings, Coarse	—	—	—	—	—	—	—	—	—
" British	—	—	—	8 12	1 2	7 10	64	2/4	1-25
Pollards, Imported -	—	—	—	6 10	1 7	5 3	60	—	—
Meal, Barley -	—	—	—	10 2	0 12	9 10	71	2/8	1-43
" Maize -	—	—	—	10 15	0 13	10 2	81	2/6	1-34
" Germ -	—	—	—	9 10	0 19	8 11	85-3	2/-	1-07
" Gluten-feed	—	—	—	8 10	1 7	7 3	75-6	1/11	1-03
" Locust Bean	—	—	—	8 0	0 9	7 11	71-4	2/1	1-12
" Bean -	—	—	—	12 5	1 12	10 13	67	3/2	1-70
" Fish -	—	—	—	18 0	4 6	13 14	53	6/2	2-77
Linseed	—	—	—	21 17	1 11	20 6	119	3/5	1-83
" Cake, English	—	—	—	12 2	1 18	10 4	74	2/9	1-47
" 9 1/2	—	—	—	—	—	—	—	—	—
Cottonseed Cake, English	—	—	—	7 10	1 14	5 16	42	2/9	1-47
" 5 1/2	—	—	—	—	—	—	—	—	—
" Egyptian	—	—	—	7 7	1 14	5 13	42	2/8	1-43
" 5 1/2	—	—	—	—	—	—	—	—	—
Decorticated Cotton	—	—	—	—	—	—	—	—	—
Seed Meal 7 1/2	—	—	—	12 15+	2 14	10 1	71	2/10	1-52
Coconut Cake 6 1/2	—	—	—	8 12	1 10	7 2	73	1/11	1-03
Palm Kernel Cake 6 1/2	—	—	—	6 2+	1 3	4 19	75	1/4	0-71
" Meal 2 1/2	—	—	—	5 5	1 4	4 1	71-3	1-2	0-62
Feeding Treacle	—	—	—	6 15	0 8	6 7	51	2/6	1-34
Brewers' Grains :-	—	—	—	—	—	—	—	—	—
Dried Ale	—	—	—	7 5	1 4	6 1	49	2/6	1-34
" Porter	—	—	—	6 15	1 4	5 11	49	2/3	1-20
Wet Ale	—	—	—	1 10	0 9	1 15	15	1/5	0-76
" Porter	—	—	—	1 7	0 9	0 18	15	1/2	1-62
Malt Culms	—	—	—	7 10+	1 14	5 16	43	2/8	1-43
Soybean Cake 6 1/2 Oil	—	—	—	10 15	2 13	8 2	69	2/4	1-25

At Liverpool.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of October and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative prices of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, suppose coconut cake is offered locally at £10 per ton. Its manurial value is £1 10s. per ton. The food value per ton is therefore 2s. 10s. per ton. Dividing this figure by 73, the starch equivalent of coconut cake as given in the table, the cost per unit of starch equivalent is 2s. 4d. Dividing this again by 22-4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1-23d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own market. The manurial value per ton figures are calculated on the basis of the following unit prices:—N, 12s.; P₂O₅, 4s.; K₂O, 2s. 4d.

rations known to give a soft butter. German experiments have also shown that soybean meal is quite a useful stuff for feeding pigs. Nils Hansson, in experimenting with soybean cake, found that the use of more than 2 lb. of the cake per head caused taint to appear in the butter. French experience showed that the fresh, non-pasteurised milk from cows given soybean cake was quite sound and wholesome, but a taste resembling that of green peas developed after the milk had been kept some time. This taint was traced to the development of micro-organisms, which, however, were killed by pasteurisation, and the tainting of butter referred to by Nils Hansson was doubtless due to the same cause. Unless therefore milk is pasteurised before distribution, it is not desirable that more than 2 lb. of soybean cake per head per day should be given to the cows. Cases of poisoning from soybean meal have also occurred in this country, but investigation of the cases showed that the poisoning was not due to the soybean meal itself but to the solvent that was used for the extraction of the oil.

General Conclusions.—Soybean cake and meal are useful feeding stuffs, are readily eaten by cattle and are useful for all classes of stock. They can be used as a substitute, weight for weight, for decorticated cotton cake in all rations in which this material is included. Owing to the laxative property of the oil contained in the cake, it can safely be used as a linseed cake substitute where linseed cake is being employed for its laxative properties.

The meal or cake can be usefully included in all lamb foods, sheep foods, pig meals and cattle cake mixtures. Milch cows may be given up to 3 lb. per head per day; fattening cattle 4 lb.; horses 3 lb.; fattening sheep and pigs 1 lb.

FARM VALUES.

CROPS.	Value per Ton on Farm.	Manurial Value per Ton.	Food Value per Ton.	Starch Equivalent per 100 lb.	Value per unit S.R.	Moist Value per unit S.R.
	£ s.	£ s.	£ s.		s. d.	d.
Wheat - - - - -	7 18	0 15	7 3	71.6	2 6	1.07
Oats - - - - -	6 12	0 13	5 19	59.5	2 0	1.07
Barley - - - - -	7 14	0 12	7 2	71.0	2 0	1.07
Potatoes - - - - -	1 19	0 3	1 16	18.0	2 0	1.07
Swedes - - - - -	0 16	0 2	0 14	7.0	2 0	1.07
Mangolds - - - - -	0 15	0 3	0 12	6.0	2 0	1.07
Good Meadow Hay - -	4 10	0 13	3 17	31.0	2 6	1.34
Good Oat Straw - - -	2 9	0 7	2 2	17.0	2 6	1.34
Good Clover Hay - - -	5 0	1 0	4 0	32.0	2 6	1.34
Vetch and Oat Silage -	1 18	0 7	1 11	14.0	2 3	1.20

* * * * *

I. Wages.—Generally speaking, few changes were made in the rates of wages agreed upon at the last Whitsun Hirings of farm workers in Scotland.

Farm Wages and Hours in Scotland.* The average earnings of a married ploughman which in 1914 were about 22s. per week, now stand at 39s., i.e., an increase of approximately 77 per cent., which compares favourably with the general increase in the cost of living.

The following table shows the course of wages and earnings in certain areas over the pre-war and highest levels (summer, 1921) up to the present time :—

Area.	Average Weekly Earn ing.					
	Summer, 1914.		Summer, 1921.		Summer, 1923.	
	Cash.	Allow- ances.	Cash.	Allow- ances.	Cash.	Allow- ances.
Lower Clyde Valley and North Ayr ...	20/-	4/-	52/-	5/-	32/-	4/-
Fife, South Forfar and Perth Lowlands	18/-	6/-	46/-	14/-	27/-	10/-
South Eastern Counties ...	19/-	3/-	52/-	—	34/-	8/6
North Eastern Counties ...	—	—	—	—	25/-	11/-
West Highlands ...	—	—	—	—	18/-	13/-

Allowances consist chiefly of a house and supplies of potatoes, milk, and oatmeal.

It is difficult to estimate the average earnings of single men. In addition to their cash wage, some of them are boarded and lodged in or near the farm-house, whilst others live in bothies and receive allowances similar to those given to married ploughmen, only less in quantity. Their earnings also vary considerably according to experience and competence. During the last two years the cash wages of single men have been subjected to greater reductions than have those of married men, and now amount to about 20s. per week plus board and lodging (valued at 14s. per week).

Only in the south-eastern counties are women usually employed in the fields, and their present earnings are roughly 22s. per week (including value of allowances). In other parts of Scotland women working on farms on other than temporary engagements generally have to perform the duties of dairymaids or kitchenmaids.

II. Hours.—In 1922 and again this year there was a move-

* From particulars given in a communication received from Sir James Wilson, K.C.S.I., which appeared in full in the *Scottish Journal of Agriculture*, Oct., 1923.

ment amongst farmers in several areas for an increase in working hours. Proposals on the subject in East Lothian led to threats of a strike in that area, and the whole question was referred to arbitration. The decision was that the total working hours in the year as a whole should be increased by 20 for the year ending Whitsunday, 1924. A time-table was subsequently drawn up and agreed to by both parties, in which the working hours are to be reckoned from the time the horses leave the stables to the time when work in the fields stops, the hours (excluding meal-times, which are not regarded as working time) being divided as follows:—

Spring and Summer 50½ per week	...	} Or an average of about 50½ hours per week for the whole year.
Seed-time (4 weeks) 54 per week ..	...
Harvest (6 weeks) 58½ per week ...	...
Oct. and Nov. (6 weeks) 50½ per week ...	...
Nov. to March (18 weeks) 46½ per week		

Provision has been made for the granting of a half-day from 12 noon on Saturdays in 42 weeks of the year.

These hours are fairly general in all areas for workers other than cattlemen and shepherds. Ploughmen, in addition to the recognised working week, have to spend an average of about 10 hours a week in the stables and in bringing the horses home, thus making their total hours of duty about 60 per week.

* * * * *

THE Sheffield Salvage Department has erected, at a cost of £250,000, a complete salvage plant for dealing with town

**Manures from
Town Refuse.**

refuse and recovering from it products which can be used as manures, etc. The refuse is sifted into three grades. The middle grade, consisting principally of cinders, is used as fuel, and is sufficient to run the whole plant and leave a balance for sale. From the coarsest grade the tins, bones, rags, etc., are collected and the balance is ground and added to the finest grade. This material, which amounts to over 95,000 tons per annum, is described as "special dust fertiliser."

Fish refuse is collected separately daily and manufactured into manure, the output being about 120 tons per annum. Condemned meat is transformed into meat meal, about 25 tons per annum, while "Hairy Guano" is produced from dead cats and dogs, amounting to about 18 tons per annum. Other materials produced in smaller amounts are bone meal, blood and vegetables, yeast and vegetables, dry vegetables, and mussel grit. Further information can be obtained from The Cleansing Department, Town Hall, Sheffield.

THE following notes dealing briefly with certain weeds which are not commonly serious but may on occasion prove troublesome, have been communicated by Mr.

**Some unusual
Weeds.**

E. Wyllie Fenton, Seale Hayne Agricultural College :—

Small Rough or Beaked Hawk's Beard (*Crepis Taraxacifolia*, Thuill.) and *Larger Hawk's Beard* (*Crepis biennis*, L.), are biennial plants which are very similar and often confused. The former is by no means uncommon in certain localities although rare in others, and both are at times troublesome weeds. As the methods of dealing with them are the same they are here considered jointly. They are generally confined to waysides, waste places and railway embankments, but, like all the Compositae, they have the habit of spreading rapidly under favourable circumstances. At present, they are not often recorded as weeds of any consequence on agricultural land, but since they spread rapidly they may become a nuisance.

One field in South Devon has been overrun with these plants, and during the last two years has been a mass of yellow bloom when cut for hay. As the seeds are formed and practically ready for distribution by the time the hay is harvested, the danger, not only to the field but to neighbouring land, is obvious.

Depasturing, or early cutting of the hay, will do much to keep the plants under control, and if continued systematically, exterminate them. During the drought of the last two summers the deep rooting system has enabled these plants to more than hold their own with grasses and clovers, which normally tend, by competition, to keep them in check.

Goat's Beard (*Tragopogon pratensis*, L.) is a biennial and usually confined to banks and waysides, but occasionally wanders into agricultural areas. A case of this kind occurred in Lundy Island during the summer of 1922. It had been present on the same area previously and had not been held in check. The result was that the oat crop was found to be full of it. So plentiful was the weed that it was quite impossible to deal with it without injuring the oats. Even spraying was tried on a small scale without success, for where the Goat's Beard was affected the crop also suffered as heavily. The final result was that the weed and crop had to be harvested together. This meant, of course, that the seeds had escaped before the plants were cut, and that much trouble and probably loss would follow later. As Goat's Beard is a biennial with a thick fleshy root the only means of eradication is prevention of seeding by early cutting; by this means it can be eradicated in a few years.

One of the *Mayweeds* (*Matricaria discoidea*, L.) of comparatively recent introduction is spreading steadily. In most cases it is to be found in patches by railway sidings, canal banks, round farm buildings, and occasionally in waste areas. It seeds very readily and owing to its prostrate growth is most difficult to handle. In the majority of cases it is confined to areas of no agricultural importance, although there are cases on record where this plant has caused damage. In Cornwall a field of oats was practically ruined by this weed one year, and a similar case occurred in Herefordshire. During 1922 part of a field in South Devon was invaded and the barley yield in the area affected was much reduced.

The only known method of controlling this weed at present is deep ploughing. This is not satisfactory, as there is always the possibility that the seeds buried may in the course of agricultural operations be again brought to the surface and the damage repeated, depending largely of course on the crop.

* * * * *

ADVICE on the eradication of acarine disease from a stock of bees is given in the Ministry's Leaflet No. 395 (*Diseases of Adult Bees*). As, however, no cure for the disease has yet been discovered, the safest course, where a stock has become affected

**Acarine Disease
of Bees.**

is to destroy the bees and the quilts and to disinfect the interior of the hive thoroughly by means of scorching with a painter's blow lamp. Should the latter not be available, the walls of the hive and the alighting board should be painted with paraffin and ignited. In this case, when sufficient scorching has taken place, the flames can be quenched by means of a wet sack. The combs may be used again provided they have been sprayed with a suitable disinfectant and allowed to stand for two months.

The following is a simple method of killing the bees in an infected stock. A cartridge made of brown paper should be smeared with sulphur paste and placed in a smoker. The entrance to the hive should be closed by means of earth, with the exception of a small aperture, made with the finger, for the insertion of the smoker-nozzle. After dark, care having been taken that the quilts in the hive fit properly, the cartridge in the smoker should be lighted and smoke puffed into the hive until the brown paper cartridge has been consumed. The aperture should then be closed and the hive allowed to stand for half an hour. The dead bees and the quilts should then be removed and burned in a hole in the ground one yard in diameter and a

foot deep. After all is consumed the hole should be filled in. If the stock has been dealt with in this manner, the spraying of the combs need not be carried out, although the combs should be allowed to stand for two months before re-use.

Note.—In Leaflet No. 395 it is stated that the Ministry will test bees for acarine disease for a nominal fee. It is regretted that it has been necessary to suspend this arrangement for the present.

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In view of the fact that many Agricultural Lecturers, County Agricultural Organisers, etc., have only restricted facilities for the use of libraries, the Rothamsted Experimental Station has arranged to have copies taken of any papers or books in their library. Particulars of the charges for various kinds of work, which are strictly moderate, may be obtained from the Director, Rothamsted Experimental Station, Harpenden.

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AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1923.

PRODUCE OF CROPS.

Preliminary Statement showing the Estimated Total Produce and Yield per Acre of the Corn and Hay Crops in England and Wales in 1923, with Comparisons for 1922, and the Average Yield per Acre of the Ten Years 1913-22.

Crops.	Estimated Total Produce.		Acreage.		Estimated Yield per Acre.		Average of the Ten Years 1913-22.
	1923.	1922.	1923.	1922.	—	1923. 1922.	
Wheat - Tons	1,515,000	1,674,000	1,740,478	1,966,806	{ Cwts. 174	170	171
Qrt.	6,862,000	7,884,000			{ Bush. 315	312	319
Barley - Tons	943,000	968,000	1,326,729	1,363,753	{ Cwts. 145	140	147
Qrt.	4,006,000	4,088,000			{ Bush. 302	297	303
Oats - Tons	1,322,000	1,252,000	1,976,294	2,157,192	{ Cwts. 134	114	133
Qrt.	5,528,000	5,289,000			{ Bush. 336	344	352
Mixed Corn - Tons	83,000	83,000	115,501	123,738	{ Cwts. 144	133	—
Qrt.	512,000	609,000			{ Bush. 354	323	—
Beans - Tons	188,000	188,000	223,422	272,021	{ Cwts. 169	138	156
Qrt.	824,000	837,000			{ Bush. 295	246	270
Pas - Tons	57,000	57,000	94,570	122,717	{ Cwts. 112	93	124
Qrt.	301,000	301,000			{ Bush. 365	179	242
Seeds Hay* - Tons	2,828,000	1,751,000	1,814,814	4,527,546	Cwts. 312	227	281
Meadow Hay† Tons	4,885,000	4,058,000			Cwts. 223	184	209

* Hay from Clover, Sainfoin, and Grasses under rotation.

† Hay from Permanent Grass.

Autumn-sown corn was drilled under favourable conditions and came through the winter well. These crops and early spring sowings withstood the cold weather of May and June with little damage, but the later sowings of barley and oats, which were frequently sown into rough seed-beds, suffered

considerably, and many crops were consequently thin and weak. Over the greater part of England the weather was fairly favourable for the harvest, and on the whole the crops were well secured. Conditions have been very different in the north-west and in Wales, where, on high farms, large areas of corn were still uncut at the middle of October, and many of the crops have been severely damaged in the stook by the continuous rains. The estimates for these districts may, therefore, require appreciable revision when harvest is completed. Wheat generally is of good quality, the grain being fairly plump, and the same may be said of winter and early-sown spring barleys and oats, but the later sowings ripened unevenly and are a poor sample.

The total production of Wheat is estimated at 1,515,000 tons, as compared with 1,674,000 tons in 1922, the whole of the reduction being due to the decline in acreage. The average yield per acre is estimated at 17·4 cwt., nearly half a cwt. per acre more than last year and one-third of a cwt. above the ten years' average. The best crops were in the eastern counties, yields being under average in most other counties. Barley is the only corn crop to give an under-average yield, the yield per acre being estimated at 14·5 cwt., or one-fourth of a cwt. below average, but half a cwt. more than in 1922. The total production of 959,000 tons, is very slightly greater than last year in spite of the reduction of 37,000 acres in the area grown. The total production of Oats, 1,322,000 tons, is 70,000 tons in excess of last year's production, as a result of the much better yield per acre, the area having been reduced by 180,000 acres. The yield per acre is estimated at 13·4 cwt., which though only a trifle above average, is 1½ cwt. per acre better than last year, and the highest yield since 1918. Mixed Corn yielded 14·4 cwt. per acre, and the total production of 83,000 tons was the same as in 1922. The yield per acre of Beans, 16·9 cwt., is 3 cwt. per acre heavier than last year and 1½ cwt. above the decennial mean, but as a result of the reduced area the total production is much the same as in 1922, viz., 188,000 tons. Although the area of Peas was reduced by 23 per cent., the yield per acre was so much better this year that the total production exceeds that of last year by 10,000 tons or about 15 per cent. The estimated yield per acre of 14·2 cwt. compares with 9·3 cwt. in 1922 and 13·4 cwt. the ten years' average.

The yields per acre and the total production of corn are given in the table both in terms of weight and of measure. When further information is received as to the natural weight of grain of this year's crop the figures by weight may require revision.

"Seeds" sown in 1922 germinated very well, and the crop suffered little damage during the winter, so that there was a strong, thick plant in the spring. Meadow Hay was checked by the cold weather of May, but grew quickly during the warm days of the latter half of June. Over most of the country the hay was secured in good condition, but in the north and in Wales hay-making was very protracted owing to the almost continuous rains, and on hill farms in these districts large areas have never been mown and much hay has been wasted after cutting. The average yield per acre of Seeds Hay is estimated at 31·2 cwt. or 3 cwt. above average, 8½ cwt. more than last year, and the best yield since 1916. With the area also largely increased as compared with last year the total production of seeds hay, 2,828,000 tons, is over 1,000,000 tons in excess of the production in 1922. The yield per acre of

Meadow Hay, 22·3 cwts., was also above average, being about $1\frac{1}{2}$ cwts. per acre above the decennial mean, and 4 cwts. per acre heavier than in 1922. The total production of 4,865,000 tons is 800,000 tons greater than last year. Taking both kinds of hay together the production is estimated at 7,693,000 tons, compared with 5,789,000 tons last year and 5,339,000 tons in 1921.

The estimates of the potato and root crops will be issued about the end of November.

PRODUCE OF HOPS.

Preliminary Statement showing the Estimated Total Production of Hops in the years 1923 and 1922, with the Acreage and Estimated Average Yield per Statute Acre in each County of England in which Hops were grown; and the Average Yield per Acre of the Ten Years 1913-1922.

COUNTIES, &c.			Estimated Total Produce.		Acreage returned on 4th June.		Estimated Average Yield per Acre.		Average of the ten years 1913 to 1922.
			1923.	1922.	1923.	1922.	1923.	1922.	
KENT	East ...	Cwts.	37,000	46,000	Acres.	4,095	10·5	11·2	11·2
	Mid ...	Cwts.	56,000	72,000	Acres.	5,204	10·7	13·1	12·2
	Weald ...	Cwts.	60,000	88,000	Acres.	6,719	8·9	12·4	10·7
	Total, Kent		159,000	206,000		15,458	9·9	12·3	11·3
HANTS ...		Cwts.	7,900	11,000	Acres.	1,073	7·8	10·3	9·7
SURREY ...		Cwts.	1,700	2,200	Acres.	217	8·1	10·1	8·2
SUSSEX ...		Cwts.	18,000	33,500	Acres.	2,354	8·1	11·2	10·1
HEREFORD ...		Cwts.	30,000	30,000	Acres.	3,915	7·7	7·6	8·3
WORCESTER ...		Cwts.	18,000	17,700	Acres.	2,082	9·3	8·7	8·8
OTHER COUNTIES*		Cwts.	700	500	Acres.	95	7·3	5·2	6·6
TOTAL ...			229,000	301,000		24,893	9·2	11·4	10·4

* Salop, Gloucester and Berkshire.

Note.—The estimated total production does not include the produce which might have been obtainable from areas left unpicked. The average yield per acre is calculated on the total area under the crop, whether picked or unpicked. The Hop Controller has advised each grower of the quantity he can take into control, and, as a consequence, the area left unpicked is larger than usual.

The total production is estimated at 229,000 cwts., which is 72,000 cwts. less than in 1922, and 38,000 cwts. below the average production in the 10 years 1913-22. In the south-eastern counties the yields per acre are considerably lower than those of 1922, particularly in Sussex, where the crop of the preceding year was very heavy. In Kent the yield is $2\frac{1}{2}$ cwts. per acre less than in 1922, and $1\frac{1}{2}$ cwts. per acre lighter than the mean of the previous ten years. Yields in the western counties are, on the whole, rather better than in 1922, the Worcestershire crop being $\frac{1}{2}$ cwt. per acre heavier than that of last year, which was an average crop, and the yield in Hereford is of practically the same weight per acre as in 1922, and about $\frac{1}{2}$ cwt. short of the ten-year mean.

Foot-and-Mouth Disease.—All restrictions in connection with the outbreaks at Grimshy; Cranleigh, Surrey; Hatfield Heath, Essex; North Farnborough, Hants; West Hoathley, E. Sussex; Sprowston, Norfolk; and Whitchurch, Bristol, have now been withdrawn.

New Centres of Infection.—Since the issue of the November *Journal*, disease has been confirmed in the following new centres up to and including 16th November:—

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|---------------|------------------------|--------------|--------------------------|
| (1) 26th Oct. | Morden, Surrey. | (6) 9th Nov. | Withconsea, Yorks, E.R. |
| (2) 27th " | Paisley, Renfrew. | (7) 9th " | Tewkesbury, Glos. |
| (3) 3rd Nov. | Dunfermline, Fife. | (8) 11th " | St. Nicholas-at-Wade, |
| (4) 6th " | Upper Wear, Riseley, | | Birchington, Kent. |
| | Beds. | (9) 15th " | Poulton-le-Fylde, Black- |
| (5) 7th " | Ruskie, near Stirling, | | pool, Lancs. |
| | Perth. | | |

There is no clue as to the origin of any of these outbreaks, the last of which occurred immediately after the restrictions in force in that portion of Lancashire had been withdrawn on 14th November.

Summary of Outbreaks.—(27th August—16th November.) The following table shows the number of outbreaks in each county from the commencement of the present series on 27th August.

County.	No. of Outbreaks.	County.	No. of Outbreaks
Bedford	1	Somerset	7
Buckingham	5	Stafford	1
Cheshire	74	Surrey	7
Denbighshire	31	Sussex E.	1
Devonshire	4	Worcester	2
Essex	5	Yorks E.R.	5
Flintshire	23	Yorks W.R.	38
Gloucestershire	10		
Hampshire	7	Scotland.	
Kent	2	Dumbarton	5
Lancashire	20	Fife	1
Lincoln (Lindsey)	1	Lanark	4
London	1	Perth	3
Norfolk	5	Renfrew	14
Salop	27	Stirling	6
		Total	308

Slaughtered.—The numbers of animals slaughtered in connection with these outbreaks are:—Cattle, 9,714; Sheep, 8,115; Pigs, 6,867; Goats, 14; and the gross compensation is estimated at £302,000, of which it is estimated that £70,000 will be recovered by way of salvage.

REPLIES TO CORRESPONDENTS.

Live-weight Increase of various Animals—E.D. asks (1) what weight of "Starch Equivalent," if properly balanced, is required to put on a pound of flesh when fed to the following (full-grown) animals:—(a) horses, (b) sheep, (c) pigs, (d) cattle; and (2) what live-weight increase will the above (full-grown) animals put on per day when receiving a fattening ration.

Reply (supplied by the Animal Nutrition Institute, University of Cambridge):
A pound of live-weight increase in the case of a full-grown steer in fresh to half-fat condition contains such an amount of protein and fat as corresponds

to about 3,250 calories. A pound of starch equivalent can supply 1,071 calories, so that practically 3 lb. of starch equivalent should enable such an animal to put on about 1 lb. of live-weight increase. If the animal is in store condition, live-weight increase contains per lb. only about 2,500 calories, so that 2.3 lb. of starch equivalent should enable an animal to put on a pound of live-weight increase. If the animal is nearly fat, a pound of live-weight increase may contain as much as 4,000 calories, and it would consequently take very nearly 4 lb. of starch equivalent to make a pound of live-weight increase in such an animal. In other words the number of pounds of starch equivalent required to make a pound of live-weight increase goes up steadily as the animal improves from the store to the fat condition. The figures appear to be very much the same in the case of full-grown sheep and full-grown pigs. It is doubtful whether any similar figures exist for horses, and as the horse has not been selected for fat production, more starch equivalent would probably be required per lb. of live-weight increase. The amount of live-weight increase which is normally put on by different animals is as follows:—Sheep, rather more than 2 lb. per week; cattle, rather more than 2 lb. per day; pigs, from $\frac{1}{2}$ to 2 lb. per day, according to age; for horses there does not seem to be any information.

Lupins and Serradella.—F.E. asks about the cultivation of these crops for improvement of poor sandy soil.

Reply: An article on the "Value of Lupins on poor light Land," by A. W. Oldershaw, Agricultural Organiser for East Suffolk, appeared in this *Journal* for January, 1920.

Serradella is sometimes used as a crop to plough under on medium light sandy soil. It does not give so bulky a crop as lupins, nor is it so commonly used in this country. It may be sown in early spring with a nurse crop of spring oats and be ploughed under after the nurse crop is harvested, or it may be sown alone. About 40 to 60 lb. of seed per acre should be allowed. It is sometimes also sown in spring on a winter crop, wheat or rye.

Calf Feeding.—G.F. asks for information as to rearing calves from birth without giving ordinary cows' milk.

Reply: Cows' milk is essential for 2-3 weeks after birth, and calves progress much more favourably if new milk is continued for 4 weeks, and if, after whole milk is discontinued, separated milk is given until the age of 12 weeks. When milk or even separated milk is only available in small quantities the directions given on pages 11 and 12 of Leaflet No. 142 may be followed.

Valuation of Manures.—H.G., referring to Leaflet No. 72, quotes the price per ton and analysis of two compound manures, and asks how to work out the cost per unit from the price in order to compare the relative value without knowing the market prices of the different ingredients.

Reply: It is impossible to work out the value of a compound manure without knowing the current unit prices. These are given weekly in the Ministry's "Agricultural Market Report" for nitrogen, soluble phosphates and potash. The unit value of insoluble phosphates is not given; it must be worked out from the current price of steamed bone flour, thus:—Price per ton steamed bone flour (week ending 12th October) £6 2s. 0d., less allowance 1 per cent. nitrogen (13s.) £5 9s. 0d., divided by percentage total phosphates (60) = approximately 1s. 10d.

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management of dairy heifers. Written by a recognised authority, this little book can be recommended to all cow-keepers and dairy farmers.

The Biology of the Fowl.—(E. Evans, 21, Rydal St., Burley, 1923, paper backs 5s., cloth backs 7s.) Mr. Ernst Evans has prepared this work for the many poultry keepers who have a keen desire to know more of the fowl. Within the compass of 160 pages he has described the physiology of the fowl and of reproduction, the blood and circulation, respiration and ventilation, the digestive and nervous systems, eggs and incubation, and the development of the chick. There are also chapters on foods, feeding, vitamins, heredity, and poultry breeding. This little book, written in lucid style and in simple language, is a useful addition to our poultry literature, and will well repay study.

Commercial Poultry Raising.—(H. A. Roberts, 607 pp. London: Chapman and Hall, 1923, 15s. net.) This book now published in London made its appearance in the United States in 1918. The author deals in detail with the problems of the commercial producer of eggs and table fowls, giving particular attention to housing and marketing. Chapters on ducks, geese, turkeys, guinea fowls, and pigeons are included. There are over three hundred illustrations.

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ADDITIONS TO THE LIBRARY.

Agriculture, General and Miscellaneous.

Sinnott, E. W.—Botany: Principles and Problems. (405 pp.) New York and London: McGraw-Hill Publishing Co., 1923, 15s. net. [58(02).]

Russell, Sir E. J.—Farm Soil and Its Improvement. (126 pp.) London: Ernest Benn, Ltd., 1923, 7s. 6d. [63.11(02); 63.16(02).]

Russell, Sir E. J.—Rothamsted and Agricultural Science. (13 pp.) London: Royal Institution of Great Britain, 1923. [37(072).]

Eaton, T. H.—Vocational Education in Farming Occupations: The Part of the Public High School. (374 pp.) Philadelphia and London: J. B. Lippincott Co., 1923, 8s. 6d. net. [37(02).]

Barthel, C.—A Review of the Present Problems and Methods of Agricultural Bacteriology. (116 pp.) Stockholm: Knut and Alice Wallenberg Foundation, 1923. [576.8.]

Horticulture.

Thompson, H. C.—Vegetable Crops. (487 pp.) New York and London: McGraw-Hill Publishing Co., 1923, 22s. 6d. [63.511(02).]

Plant Diseases.

Bewley, W. F.—Diseases of Glasshouse Plants. (208 pp.) London: Ernest Benn, Ltd., 1923, 12s. 6d. net. [63.23; 63.24.]

Fryer, P. J.—Successful Spraying and How to Achieve It. (154 pp.) London: Ernest Benn, Ltd., 1923, 7s. 6d. [63.294(02).]

Live Stock.

Oregon Agricultural Experiment Station.—Bulletin 198.—Pattening Lambs on Alfalfa. (16 pp.) Corvallis, 1923. [63.531; 043.]

Kent, Surrey and Sussex Farmers' Co-operative Bacon Factory, Ltd.—A Reference Work on Bacon Figs and Their Factory. (80 pp.) Letcham, 1923, 2s. 6d. [63.64; 664.9.]

Texas Agricultural Experiment Station.—Bulletin 305.—Swine Feeding Experiments. (41 pp.) Brazos County.—1923. [63.64; 043.]

Dairying.

Leitch, K. H.—Dairy Farming. (304 pp.) [Scottish Series of Junior Agricultural Textbooks.] Edinburgh: W. Green & Son, 1923, 6s. net. [63.70(02).]

Mackintosh, J.—Dairy Cattle. (77 pp.) [Successful Farming Series.] London: Ernest Benn, Ltd., 1923, 1s. 6d. net. [63.711(04).]

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE,
By Metchin & Son, Princes Street, Westminster, S.W.1.

